STRUCTURE OF MICROCARD

A01/1 = Structure of microcard

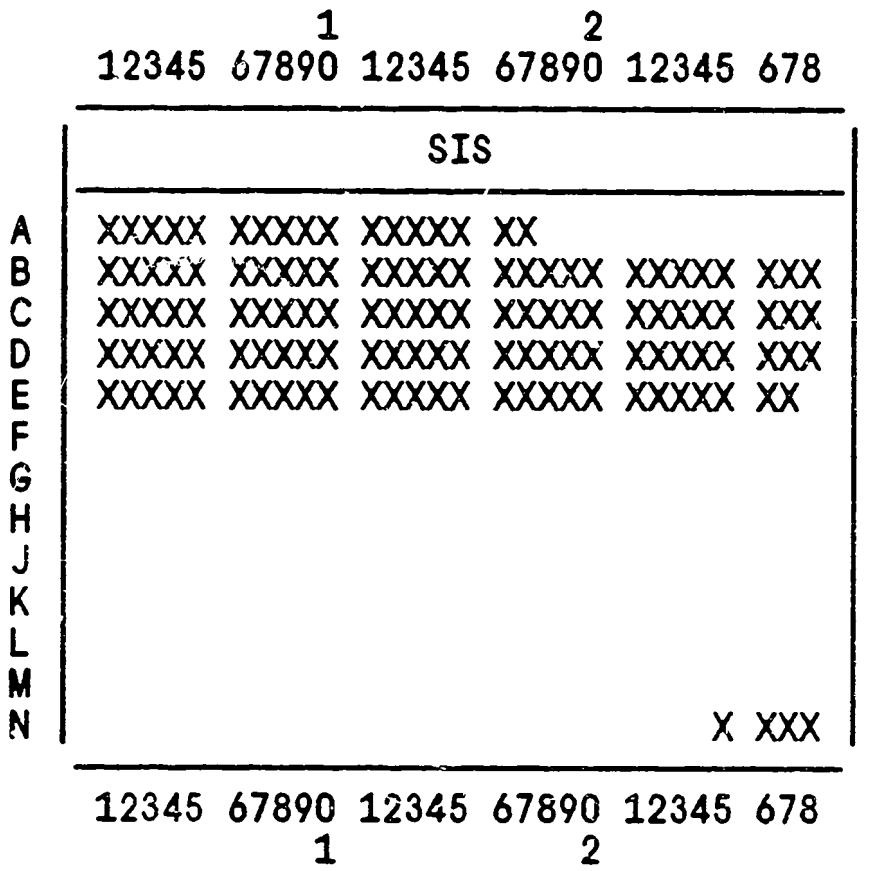
A03/1 = Special features, general instructions, safety measures, testers, devices and tools

B01/1 = Repair, testing

N27/1 = Table of contents

N28/1 = Editorial note

Continue: A02/1 Fig.: A01/2



Continue: A02/1

STRUCTURE OF MICROCARD

The user prompting appears on every page, e.g.:

- Continue: B17/1
- Continue: B18/1 Fig.: B17/2
- Yes: B18/1 No: B15/1
- Yes: B17/1 No: B16/1 Fig.: B15/2

.../1 = upper coordinate half
.../2 = lower coordinate half

Continue: A03/1

SPECIAL FEATURES

These instructions give a detailed description of repair, checking and adjustment of the

RE GOVERNOR POSITIONER RE 22

on size "M" in-line pumps.

The RE positioner is part of the EDC system (Electronic Diesel Control) for diesel passenger vehicles. It is attached in place of the standard mechanical governor directly to the corresponding fuel-injection pump with which it forms an IP assembly.

Continue: A03/2

SPECIAL FEATURES

The positioner RE 22 is basically the same as the positioners RE 24/RE 30 on size "P" fuel-injection pumps.

Differences:

* No system speed sensor. A toothed disk with a tooth for the start-of-delivery mark is installed on the camshaft instead of the speed-sensor pulse wheel.

* No oil pump.

Continue: A04/1

SPECIAL FEATURES

Further differences:

* Armature of servo magnet with no interchangeable thrust pin. There is thus no need for adjustment of the dimension "X" required with RE 24/RE 30.

* Cable bushing for electrical positioner connection with overhung 5-pin plug-in coupling from Kostal.

Continue: A04/2

SPECIAL FEATURES

Special features of M-type fuel-injection pump with RE 22 as opposed to version with mechanical governor:

* The control rod forms a non-detachable unit together with the plate washer and riveted-on short-circuiting ring of the RPS. The complete unit has to be replaced in the event of a defect (worn control rod, damaged short-circuiting ring).

* Camshaft with cylindrical shaft end on governor end.

Continue: A05/1

SPECIAL FEATURES

Further special features of M-pump:

* Fuel inlet to suction chamber via EHAB (electro-hydraulic shut-off device).
  Function: The EHAB is part of the EDC safety system and takes the form of a solenoid-controlled switching valve. It works in combination with the fuel supply pump. When set to operating position (application of current, as of start of engine) the pump suction chamber is filled by the supply pump via filter and EHAB.

Continue: A05/2

SPECIAL FEATURES

Further special features of M-pump:

When the engine is switched off (EHAB deenergized), the solenoid valve reverses the direction of fuel delivery. The supply pump draws the fuel out of the pump suction chamber, thus causing filling of the plunger-and-barrel assemblies to be rapidly interrupted and the engine to be shut off. The EDC safety system triggers this function in the event of a serious fault (e.g. control rod sticking) so as to immediately switch off the engine.

Continue: A06/1

SPECIAL FEATURES

Further special features of M-pump

* Fuel sensor installed in EHAB as additional component.

* All fuel connections to injection pump, EHAB and supply pump take the form of plug connections with plastic plug-in couplings and retainers.

Continue: A07/1

GENERAL

The repair and testing of RE positioners was grouped together in these instructions since the scope of repair work on the positioner itself is not particularly extensive and since various operations linked to positioner assembly are performed on the injection-pump test bench.

Continue: A07/2

GENERAL

As regards repairs to the M-type fuel-injection pump with RE positioner there are no differences as opposed to versions featuring a mechanical governor.
Reference is thus made in this respect to the existing repair instructions for M-pumps.

Attention is additionally to be paid to the following:

Continue: A08/1

GENERAL

* The control-rod return spring is relatively strong. In order to be able to sensitively check the freedom of movement of the control rod at all times during pump assembly, the spring should be fully pretensioned with the aid of the spring tensioner 0 986 612 311 (KDEP 1704) and thus deactivated.

* Camshaft chamber of injection pump is only to be checked for leaks with positioner installed and tightly sealed.

Continue: A08/2

GENERAL

When performing positioner repairs, worn, damaged and electrically defective components are always to be renewed.

Servo magnet, RPS, contact plate, cable bushing with 5-pin lead and Kostal plug are installed in the positioner cover and can be replaced separately.

Continue: A09/1

GENERAL INSTRUCTIONS

All individual parts are supplied as service parts in corrosion-proof packaging and must be stored in this packaging until ready for use. This applies above all to the servo magnet.

Complete positioners are supplied in packaging which is resistant to impact, breakage and corrosion, and are likewise to be stored in the original packaging.

Re-useable/new positioner covers are to be handled with extreme care and whilst maintaining upmost cleanliness.

Continue: A09/2

GENERAL

Reusable parts, which are to be stored for a lengthy period, are to be covered and protected against dirt/ rust.

Always renew seals and seal rings on positioner assembly.

Continue: A10/1

SAFETY MEASURES

Component cleaning: Wash out in commercially available cleaning agent such as Chlorothene NU, which is not readily flammable, and blow out with compressed air.

Skin protection: In order to avoid the possibility of skin irritation when handling calibrating oil, oils and greases, apply hand cream before starting work and wash hands in soap and water when finished.

Continue: A10/2

SAFETY MEASURES

Safety regulations for the handling of flammable liquids:

* In Germany:
  Order governing work with flammable liquids (VBF) published by Federal Ministry of Labor (BmA).
  Safety regulations for use when handling chlorinated hydrocarbons:
  - for companies: ZH 1/222
  - for employees: ZH 1/129
  published by Main Body of Industrial Mutual Indemnity Associations (central association for accident prevention and industrial medicine), Langwardweg 103, 53129 Bonn.

Continue: A11/1

SAFETY MEASURES

Safety regulations when handling flammable liquids (continued):

* In all other countries:

  In all other countries the local regulations are to be observed.

Continue: A11/2

SAFETY MEASURES

When repairing and testing injection pump/positioner make exclusive use of the special tools and testers listed in these instructions/in the product-related instructions.

If use is made of incorrect/unsuitable tools and testers, there is a danger of injury/damage to products and component parts.

Continue: N27/1

TESTERS, DEVICES AND TOOLS

A list is given of the testers, devices and tools required for the RE 22 positioner.

There is no listing of the standard devices and tools specific to M-pumps or of commercially available tools.

The special test equipment for test-bench checking of the respective IP assembly is given in the appropriate test specification sheet.

Continue: A13/1

TESTERS, DEVICES AND TOOLS

* Test control unit (universal evaluation circuit) for checking and adjusting RPS.	0 986 610 101 KDEP-P 400/1
* Universal test lead (connection of test control unit in conjunction with the following RE 22-specific adapter lead)	0 986 610 102 KDEP-P 400/2

Continue: A13/2

TESTERS, DEVICES AND TOOLS

* Adapter lead for RE 22-specific positioner connection with Kostal plug	0 986 610 112 KDEP-P 400/9

Continue: A14/1

TESTERS, DEVICES AND TOOLS

* Regulator 12 V/15 A (adjustable current output) for actuating servo magnet	comm. avail.
* Regulator 12 V/3 A for supplying power to test control unit and EHAB	comm. avail.
* Voltmeter (digital multimeter) Requirements: Basic accuracy DC: - less than 0.1 % of reading - resolution 0.001 V in range up to approx. 4 V	comm. avail.

Continue: A14/2

TESTERS, DEVICES AND TOOLS

* Assembly gauge for checking position of RPS short-circuiting ring	0 986 612 590 KDEP 1909
Start-of-delivery blocking device for fixing toothed disk at start of delivery	0 986 611 746 KDEP 1077

Continue: A15/1

TESTERS, DEVICES AND TOOLS

* Retainer for blocking start-of-delivery toothed disk on tightening fastening nut	0 986 612 601 KDEP 1912
* Camshaft blocking device (blocking at drive coupling)	0 986 612 056 KDEP 1545
* Guide pins (set of 2) for installing positioner cover on housing	0 986 612 598 KDEP 1910

Continue: A15/2

TESTERS, DEVICES AND TOOLS

* Pin-type socket wrench for counter-holding RPS plastic seal when drilling out	0 986 611 459 KDEP 2990
* CRT measuring device	1 688 130 130
* Accessory set for 1 688 130 130	1 687 000 053

Continue: A16/1

TESTERS, DEVICES AND TOOLS

* Coupling pin Special accessory for 1 688 130 130 for M-pump with RE 22 Note: Coupling pin is part of following connection set EPS 912	1 683 527 066
* Connection set Parts set with all necessary connections, lines etc. for M-pumps of plug type	1 687 010 083 EPS 912

Continue: A16/2

TESTERS, DEVICES AND TOOLS

* Measurement stand for checking armature clearance of servo magnet		4 851 601 124 or comm. avail.
* Dial indicator for checking armature clearance	e.g. or	1 687 233 011 1 687 233 012 (prestroke dial indicator)

Continue: A17/1

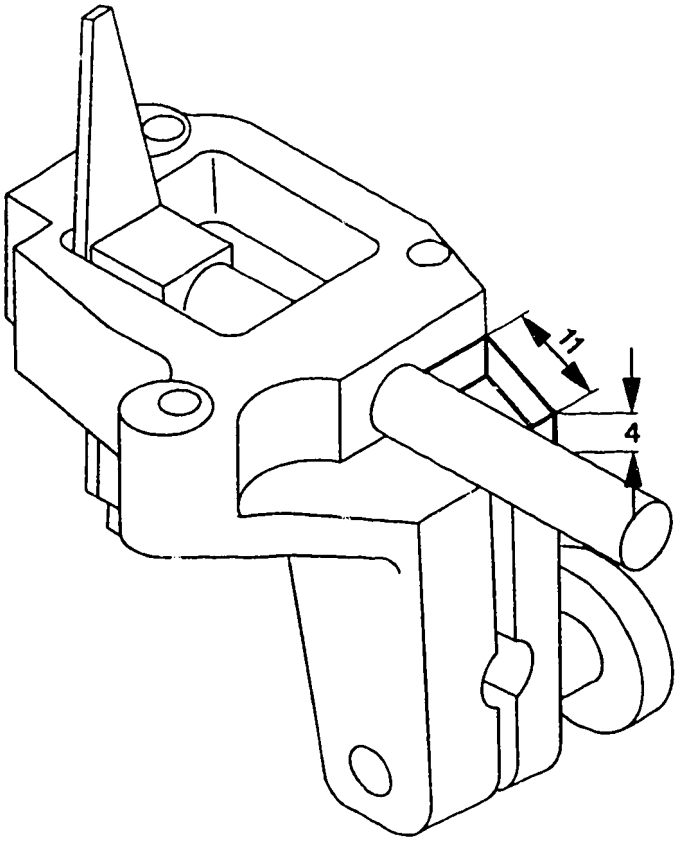
TESTERS, DEVICES AND TOOLS

* Prestroke measuring device — 0 681 440 017
  Note: On account of the EHAB add-on flange existing prestroke measuring devices are to be given a 4 mm chamfer at the location shown.
  New devices have already been appropriately reworked.

* Dial indicator for prestroke measuring device (30 mm, division 0.01 mm, with return spring) — 1 687 233 012

Continue: A18/1 Fig.: A17/2

KMK04541



TESTERS, DEVICES AND TOOLS

Illuminated magnifier min. 6x magnification or workshop microscope, 10x magnification	comm. avail. or Bosch 1 987 600 005 comm. avail.

For visual assessment of crimp connections at contact plate in positioner.

Continue: A18/2

TESTERS, DEVICES AND TOOLS

* Soldering iron for soldering/unsoldering leads at contact plate in positioner	comm. available

Requirements:
- regulated temperature
- soldering-tip temperature 350...370 Grad C
- power approx. 50 W

Recommendation:
- Weller soldering station WTCP-S with
- soldering iron TCP-S 24 V, 50 W
- soldering tip no. 7, long, tapered, 370 Grad C

Continue: A19/1

TESTERS, DEVICES AND TOOLS

* Soldering tin:
  With no bismuth or cadmium
  content.

  Recommended soldering tin:
  DIN Sn60 Pb Cu2 or Sn63 Pb.

  Recommended flux:
  IN F-SW 26 (2.5%) or
  in USA: Type RMA 2...3% QQ-S-571

Continue: N27/1

TEST SPECIFICATIONS

There is a test-specification sheet, which is to be determined according to combination number and table of contents, for every injection-pump assembly with RE positioner. This test-specification sheet contains all the necessary test specifications and settings.

These repair instructions therefore only encompass generally valid values which are the same for all positioners.

Continue: A20/2

TEST SPECIFICATIONS

General test specifications:

Resistance measurements at 5-pin Kostal connector:

1-6 (RPS coil 1) 17...23 Ohm
7-6 (RPS coil 2) 17...23 Ohm
1-7 (RPS total) 34...46 Ohm
2-3 (Servo magnet) 0.55...0.90 Ohm
4-5 = not used

Continue: A21/1

TEST SPECIFICATIONS

General test specifications:

Resistance measurements directly
at component leads of inner
contact plate:

1–6 (green–red)	17...23 Ohm
7–6 (black–red)	17...23 Ohm
1–7 (green–black)	34...46 Ohm
2–3 (brown–brown/white)	0.55...0.90 Ohm

Continue: A21/2

TEST SPECIFICATIONS

General test specifications:

EHAB internal resistance
(both pins on right): 6.8...7.8 Ohm

Fuel temperature sensor in
EHAB (both pins on left),
resistance value at calibr-
ating-oil temperature
38...42 Grad C: 950...1400 Ohm

EHAB functional test:
refer to checking/adjustment
instructions,
coordinate: E04/1

Continue: N27/1

ADHESIVES AND LUBRICANTS,
MATERIAL DESIGNATIONS

* Hot bearing grease for seal rings etc.	
Tube 45 ml	5 700 002 005
Tube 225 ml	5 700 002 025
* Oil for first pump fill:	SAE 20 W 20
* Molycote grease for clamping screw of RPS.	
Molycote M55 Plus	5 903 060 000

Continue: N27/1

TIGHTENING TORQUES

Positioner only. For M-pump tightening torques refer to appropriate repair instructions.

Positioner cover - housing:	5...7 Nm
Servo magnet - retaining plate (2 screws):	9...11 Nm
Contact plate (1 screw):	4...6 Nm
Cover plate for contact plate (3 screws):	9...11 Nm

Continue: A23/2

TIGHTENING TORQUES

RPS tensioning screw (tighten quickly and smoothly):	15...18 Nm
Fastening nut Start-of-delivery toothed disk on camshaft:	65...75 Nm

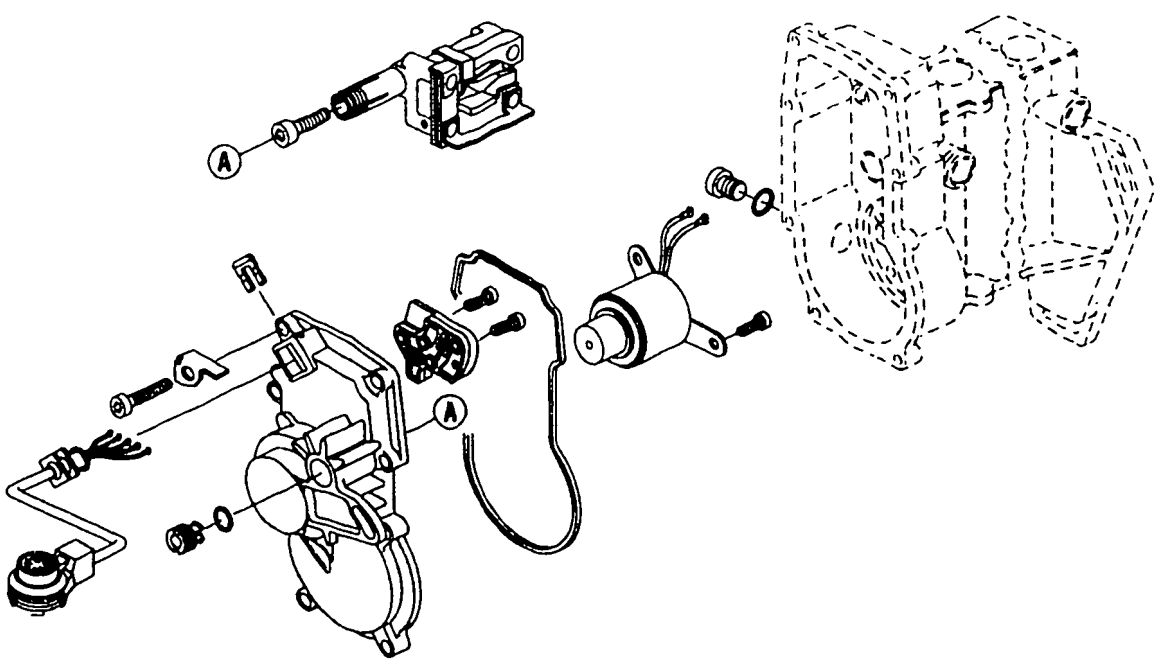
Continue: N27/1

POSITIONER COMPONENTS

The picture shows the component parts and their location in the positioner RE 22.

Continue: N27/1 Fig.: A24/2

KMK04542



POSITIONER DISASSEMBLY

Assembly work on the positioner is not particularly extensive. The individual components of the positioner - RPS, servo magnet and contact plate with connecting cable - are all located in the positioner cover. Removing the positioner from the fuel-injection pump thus only involves removing the positioner cover.

The positioner housing forms a unit with the pump housing. The start-of-delivery toothed disk and the RPS short-circuiting ring on the control rod are part of the injection pump.

Continue: B01/2

POSITIONER DISASSEMBLY

The start-of-delivery toothed disk can only be removed when performing assembly work on the fuel-injection pump.

Positioner assembly operations can also be performed with the injection pump mounted on a test bench.

Refer to the following special sections as regards testing and repair of the positioner cover:

Testing - coordinate: B09/1

Repair - coordinate: B22/1

Continue: B02/1

POSITIONER DISASSEMBLY

Mount injection pump with appropriate flange and drive coupling (see repair instructions) on rotatable assembly frame 0 986 611 248 (KDEP 2919) or on injection-pump test bench.

Unscrew EHAB (1), supply pump (2) and spring-chamber closing cover (3).

Continue: B03/1 Fig.: B02/2

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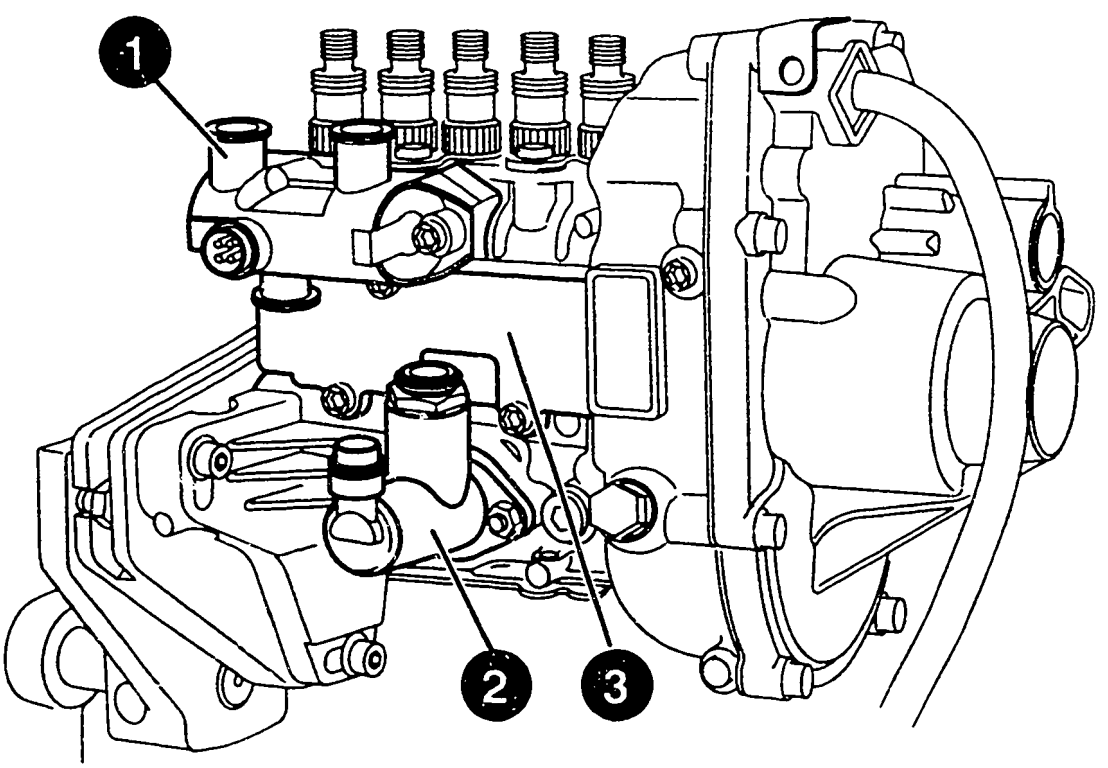
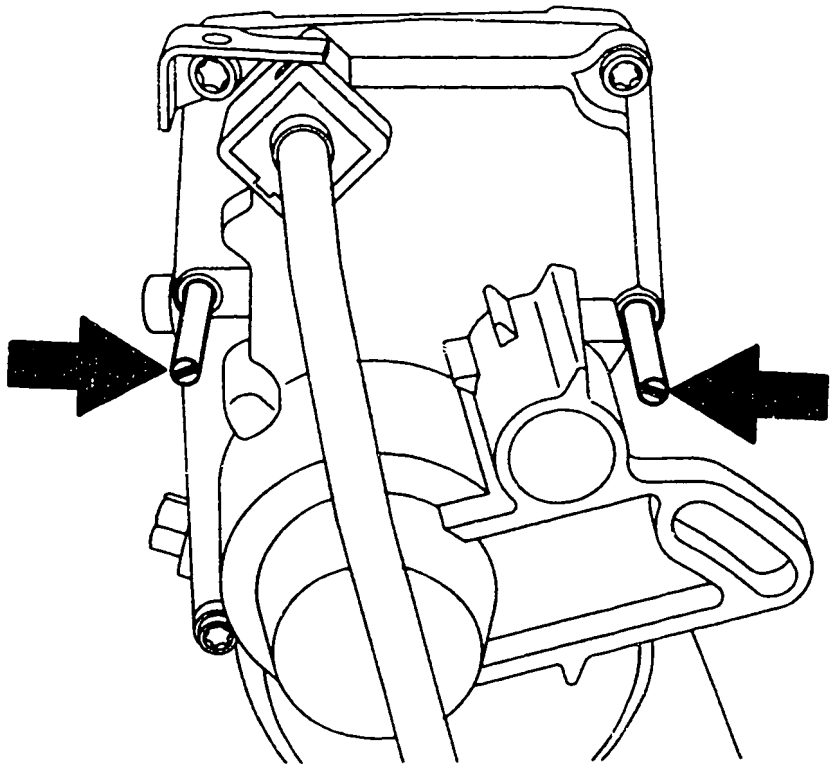


POSITIONER DISASSEMBLY

Screw out two fastening screws of positioner cover at magnet level and screw in guide pins 0 986 612 598 (KDEP 1910) (arrows).
Screw out remaining screws and remove entire positioner cover axially by way of guide pins. Catch residual oil.
Proceed carefully so as not to damage measurement arm and short-circuiting ring of RPS.
Note: If repair work is only to be performed on positioner cover, continue as of Section CLEANING COMPONENTS on coordinate: B08/1

Continue: B04/1 Fig.: B03/2

KMK04544

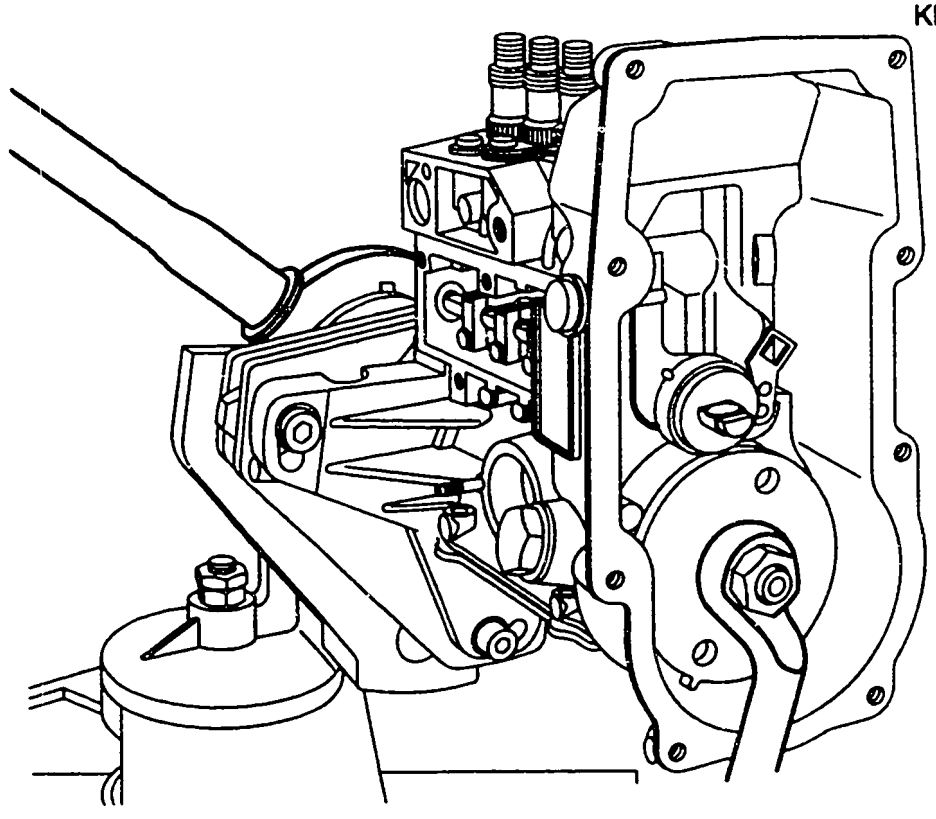


POSITIONER DISASSEMBLY

If disassembly work is to be performed on the injection pump, unscrew fastening nut of start-of-delivery toothed disk (whilst counterholding drive coupling) and remove toothed disk from camshaft.

Continue: B05/1 Fig.: B04/2

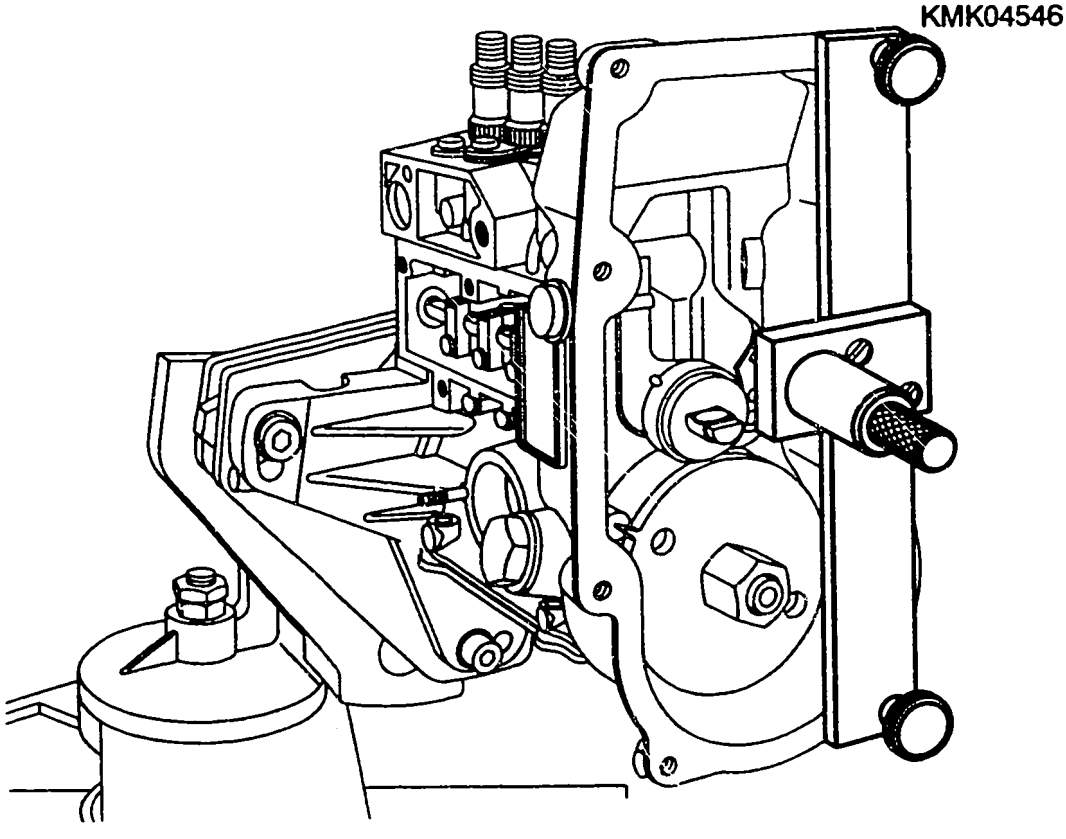
KMK04545



POSITIONER DISASSEMBLY

Prior to further disassembly of fuel-injection pump, check position of RPS short-circuiting ring at control rod with assembly gauge 0 986 612 590 (KDEP 1909).
This is necessary since the position of the short-circuiting ring cannot be checked once the control rod has been removed (complete unit with plate washer, short-circuiting ring and cap nut).

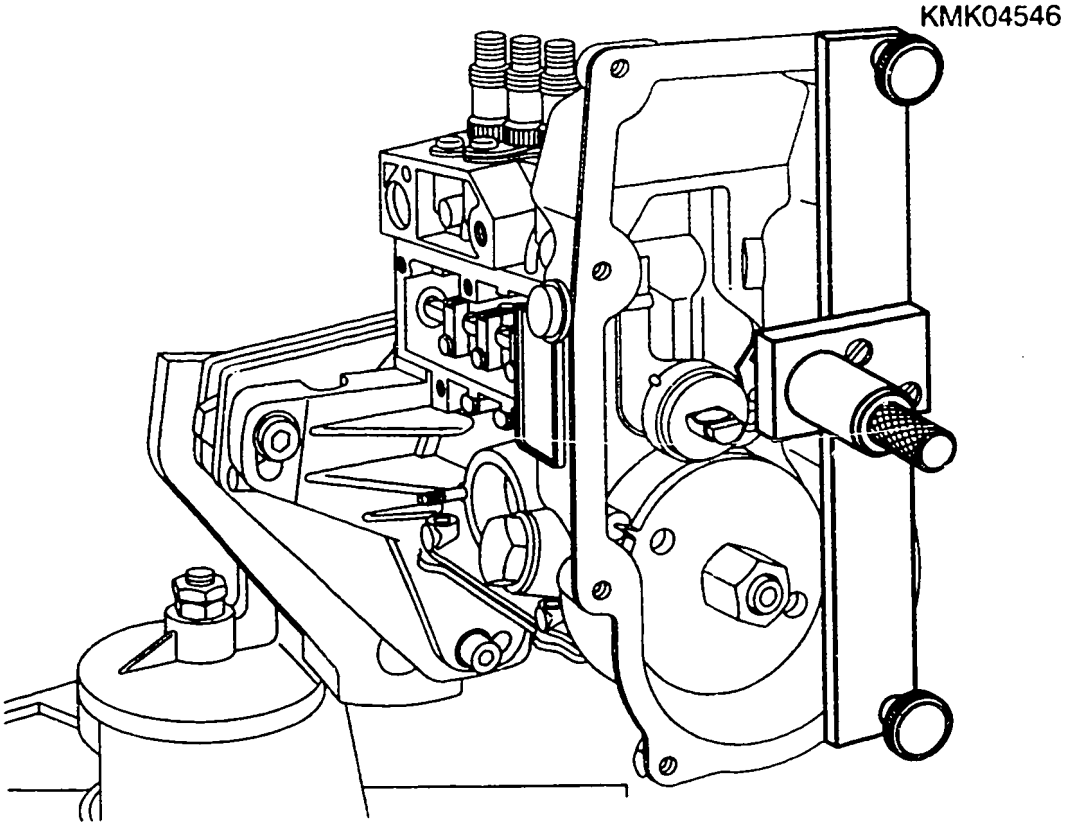
Continue: B06/1 Fig.: B05/2



POSITIONER DISASSEMBLY

Screw assembly gauge with retracted measurement pin into right-hand tapped holes in housing using appropriate knurled screws.

Continue: B07/1 Fig.: B06/2



POSITIONER DISASSEMBLY

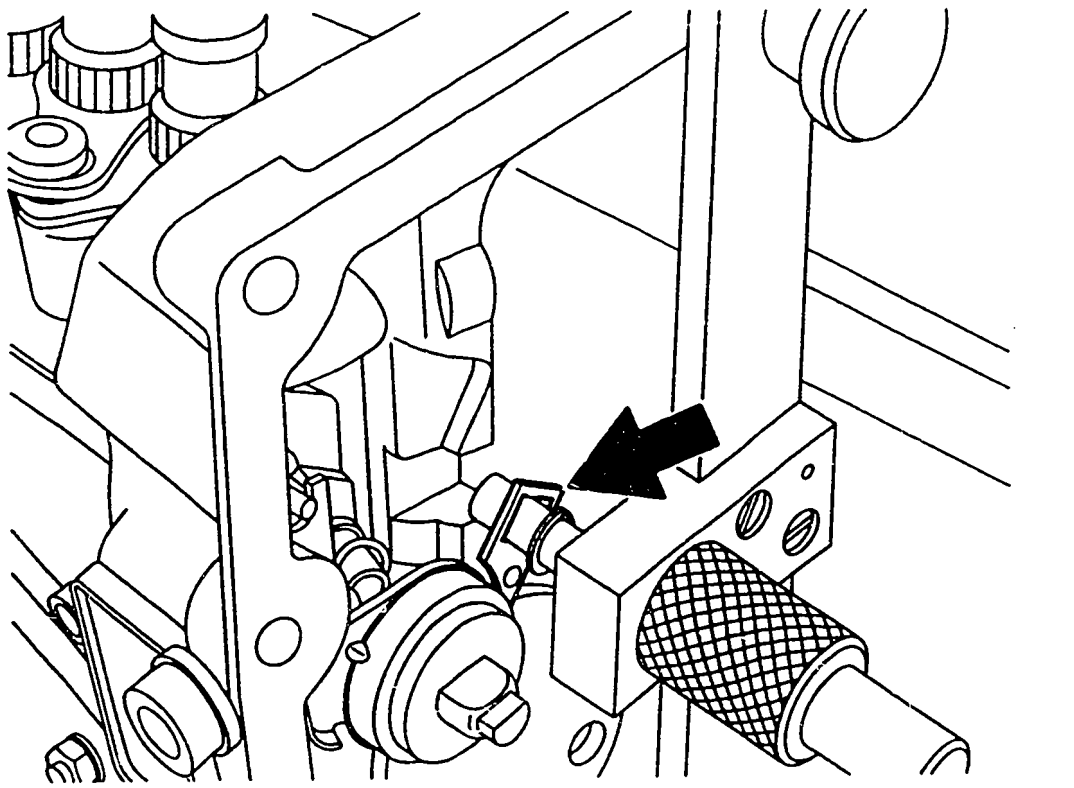
It must then be possible to insert the smallest diameter of the measurement pin of the assembly gauge into the short-circuiting ring without exerting any force (arrow).

Replace control rod if position of short-circuiting ring does not coincide with that of assembly gauge.

Refer to appropriate repair instructions as regards further disassembly of the fuel-injection pump.

Continue: N27/2 Fig.: B07/2

KMK04547



CLEANING OF COMPONENT PARTS

Wash out component parts in commercially available cleaning agent such as Chlorothene NU, which is not readily flammable, and then blow out with compressed air.

Important note: Cleaning agent must not be allowed to get into the armature gap of the servo magnet and the vent duct for the magnet when cleaning the positioner cover. Extreme care should be exercised when cleaning the other cover components.

Continue: B08/2

CLEANING OF COMPONENT PARTS

Pay attention to the following safety precautions:
Order Governing Work with Flammable Liquids (Vbf) as issued by Federal Labor Ministry (BmA).
Safety regulations for handling chlorinated hydrocarbons:
For companies ZH 1/222
For employees ZH 1/129
as published by the Main Association for Industrial Mutual Indemnity Associations (Central Association for Accident Prevention and Industrial Medicine), Langwartweg 103, D-53129 Bonn.
The appropriate local regulations are to be observed in other countries.

Continue: N27/2

CHECKING POSITIONER COVER

The positioner cover is the main component of the RE 22 positioner. It accommodates the RPS, the servo magnet and the contact plate for the electrical connections.

These components are to be checked and can be individually replaced if faulty.

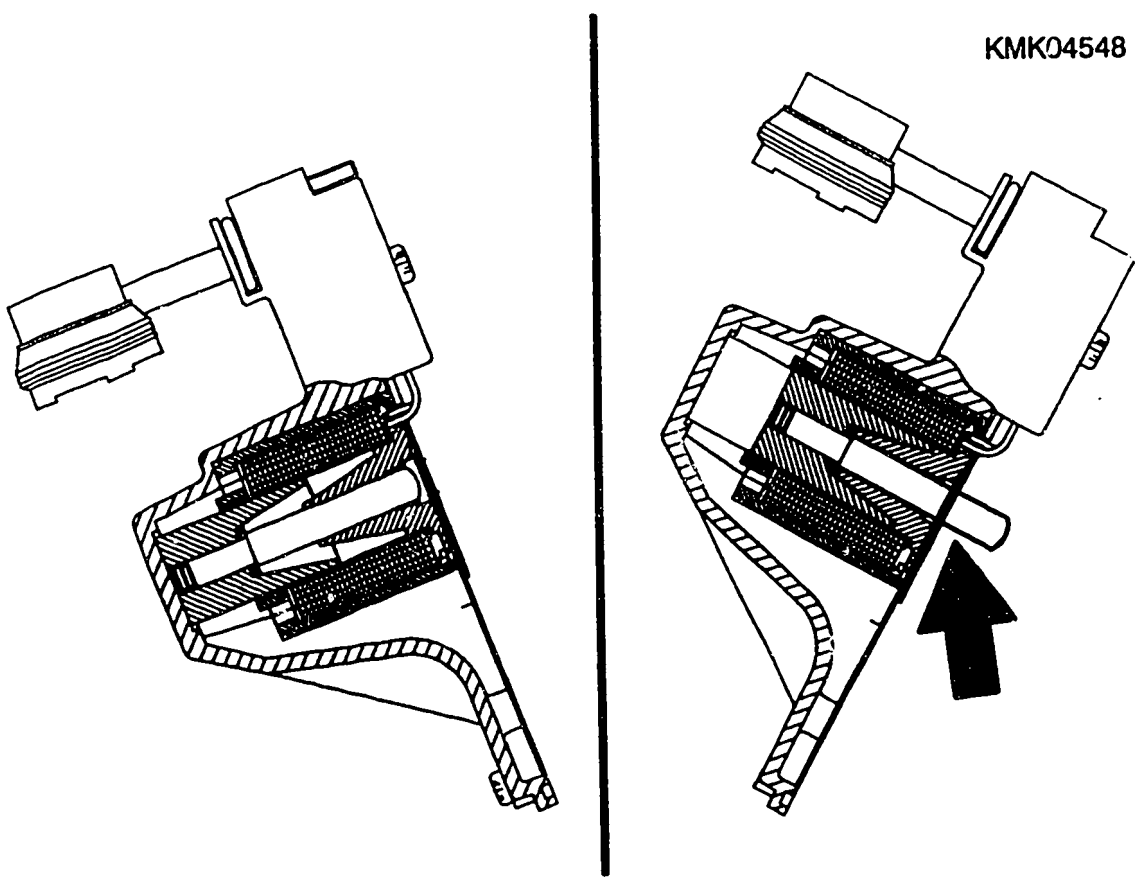
The positioner cover and the components located in it must be kept free of dirt and chips and must not show any signs of mechanical damage.

Continue: B10/1

CHECKING POSITIONER COVER

Checking freedom of movement of servo-magnet (magnet in situ):
When the positioner cover is inclined approx. 30 Grad from the perpendicular (approx. 30 Grad magnet tilt) in both directions, the weight of the armature must cause it to move to the respective stop.
If this is not the case, remove magnet, clean armature and armature bore and apply small quantity of engine oil SAE 20 W 20 to both. Replace magnet if this does not produce freedom of movement. For removal and installation refer to coordinate: B23/1

Continue: B11/1 Fig.: B10/2



CHECKING POSITIONER COVER

Checking freedom of movement of servo-magnet:

Important:

Checking the freedom of movement of the armature as described above did not involve removing the magnet. This suffices if the fuel-injection pump is not specifically thought to be sticking. One-sided wear of the armature bush, such as may occur after lengthy running, may result in stiffness during operation, which cannot be detected in the course of this test.

Continue: B11/2

CHECKING POSITIONER COVER

Important:
Removal of the magnet and precise measurement of the bearing clearance are an absolute must in the case of pumps with many hours of operation, general overhaul or a concrete complaint about "unstable engine idling behavior" (in the event of considerable instability combined with the error message "permanent system deviation").

For removal and installation of magnet see coordinate: B23/1

For measurement process see following coordinate.

Continue: B12/1

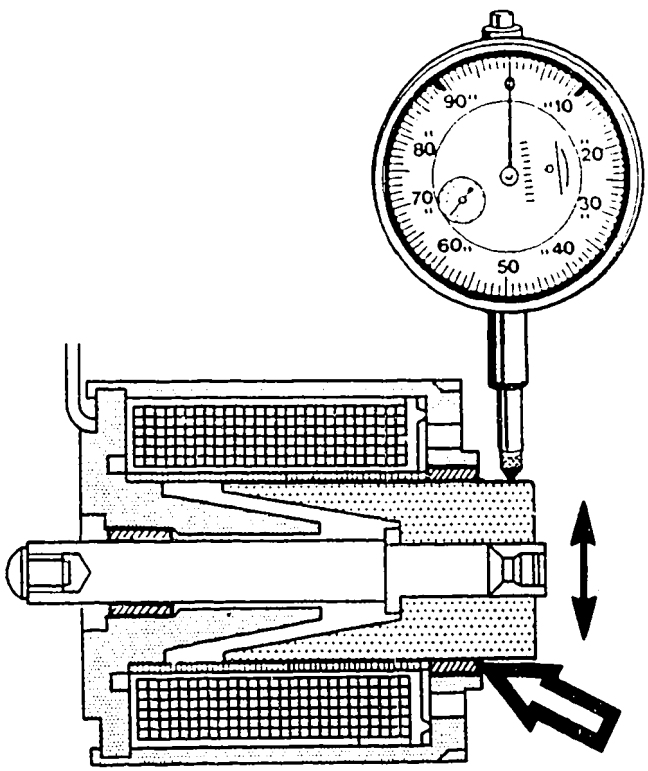
CHECKING POSITIONER COVER

Checking large bearing bush in servo-magnet (arrow) for wear:

To perform check, place magnet in prism and pull out armature slightly. Position dial indicator (e.g. 1 687 233 011) with stand (e.g. 4 851 601 124) on armature. Move armature up and down whilst turning magnet in prism and thus measure maximum bearing clearance.

The maximum bearing clearance of the large bush may be 0.16 mm. Replace magnet if this value is exceeded.

Continue: B13/1 Fig.: B12/2



KMK 03078

CHECKING POSITIONER COVER

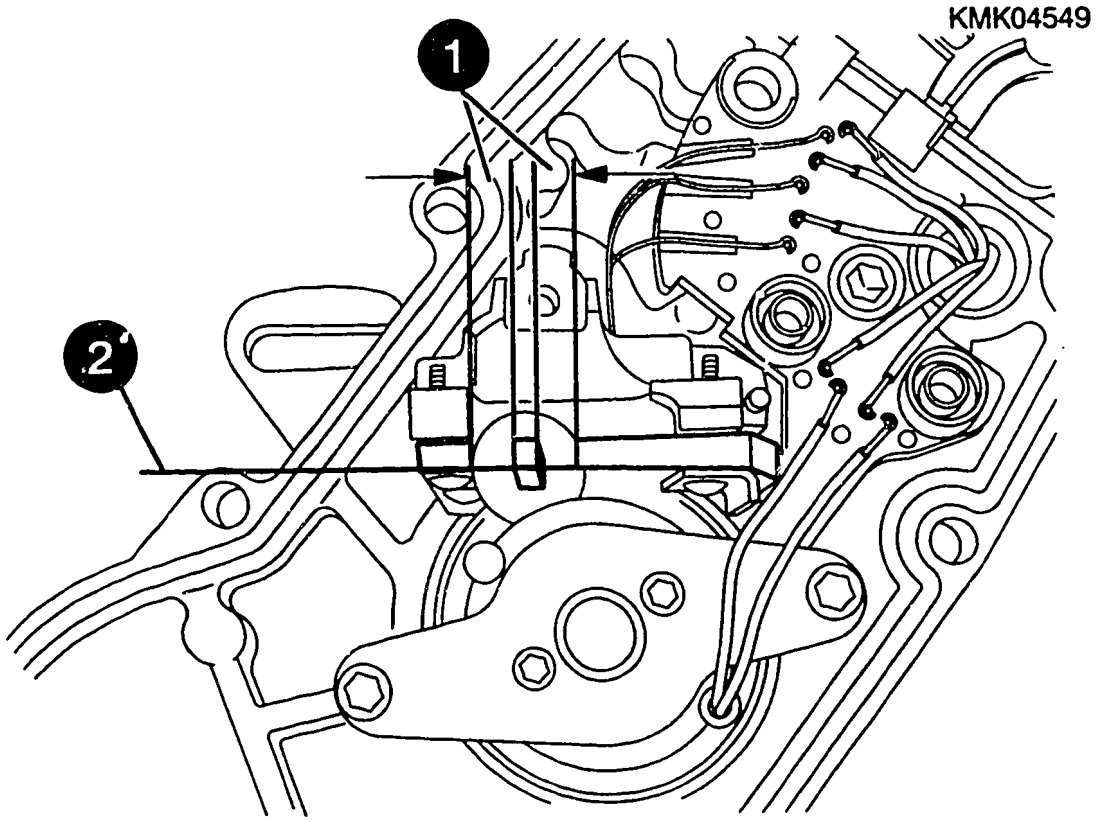
RPS mechanical test:

The RPS must not show any signs of mechanical damage or be bent. All components (e.g. screws, coils) must be tight.
Pay attention to cleanliness, also as regards chips at laminated core.

The measurement arm must be centred with (1) and in alignment with (2) the two outer arms.

Is RPS in proper mechanical working order?

Yes: B15/1 No: B14/1 Fig.: B13/2



TESTING POSITIONER COVER

Replace damaged rack position sensor.
When doing so pay attention to removal
and installation instructions as of
Coordinate: B25/1

Continue: B15/1

CHECKING POSITIONER COVER

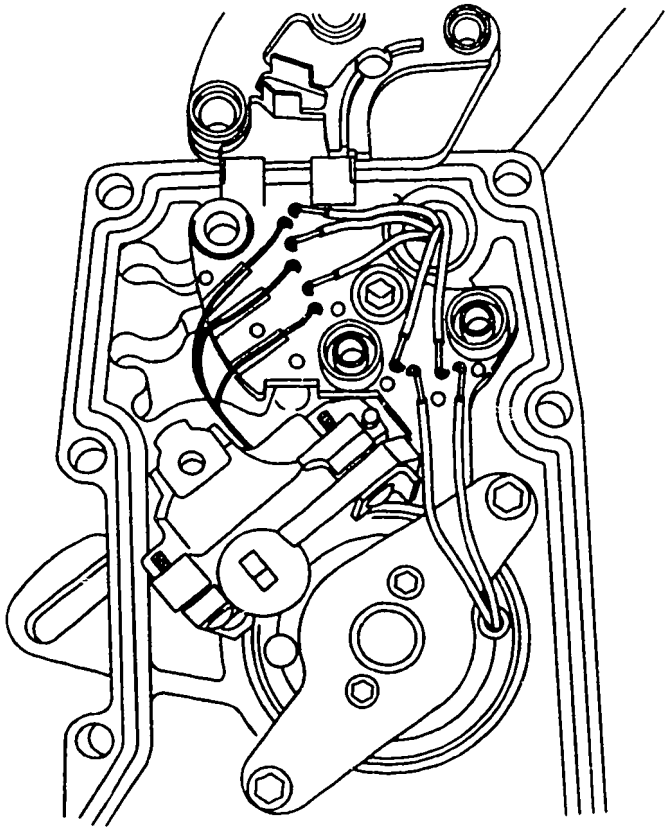
Contact plate, leads, soldered joints:

Assess by way of visual inspection. This requires the use of an illuminated magnifier (min. 6x magnification, e.g. Bosch 1 687 600 005) or a workshop microscope (10x magnification).

Unscrew cover plate of contact plate (3 screws) and fold back (film hinges).

Continue: B16/1 Fig.: B15/2

KMK04550



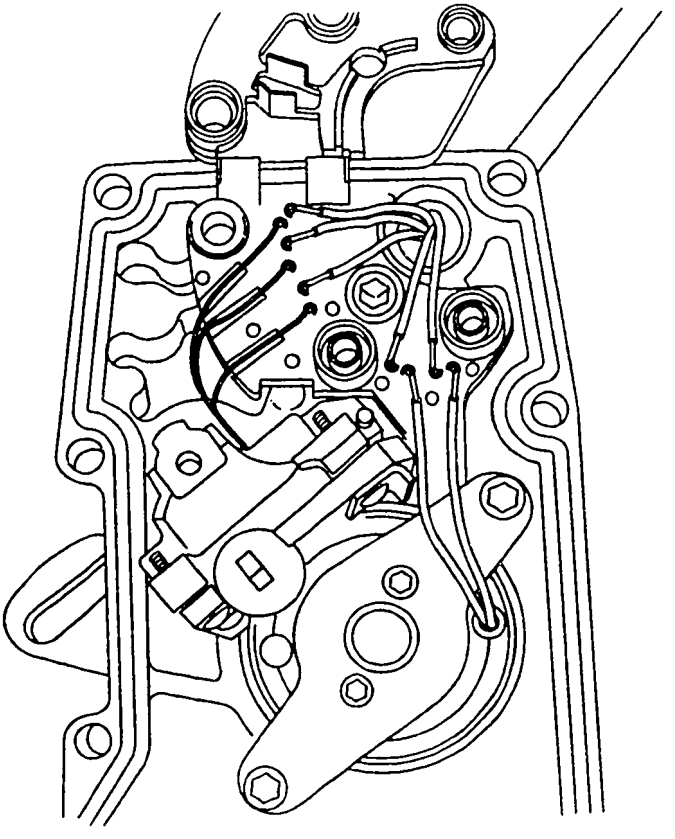
CHECKING POSITIONER COVER

Contact plate, leads, soldered joints:

Check proper condition of soldered joints, strength of soldering-tab crimps on leads and proper condition/ proper laying of leads. In case of doubt, resolder joints; where appropriate, replace component concerned if leads are damaged. Refer to repairing positioner cover as of coordinate B22/1.

Continue: B17/1 Fig.: B16/2

KMK04550



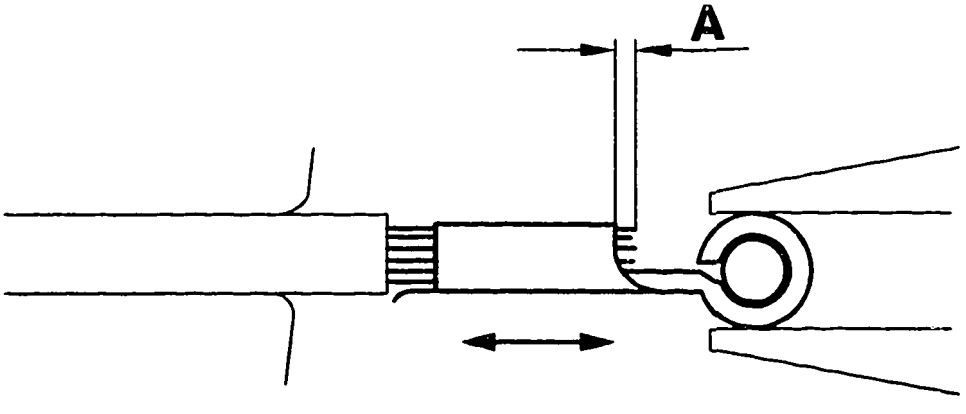
CHECKING POSITIONER COVER

Contact plate, leads, soldered joints:

Special attention is to be paid to the strength of the crimp connections for the leads. For this purpose, lift leads out of cable duct and move back and forth in stranded-wire direction using pointed pliers whilst observing crimp connection under magnifier.
In doing so, hold soldering lugs with pliers.
Take care not to kink leads.

Continue: B18/1 Fig.: B17/2

KMK04056



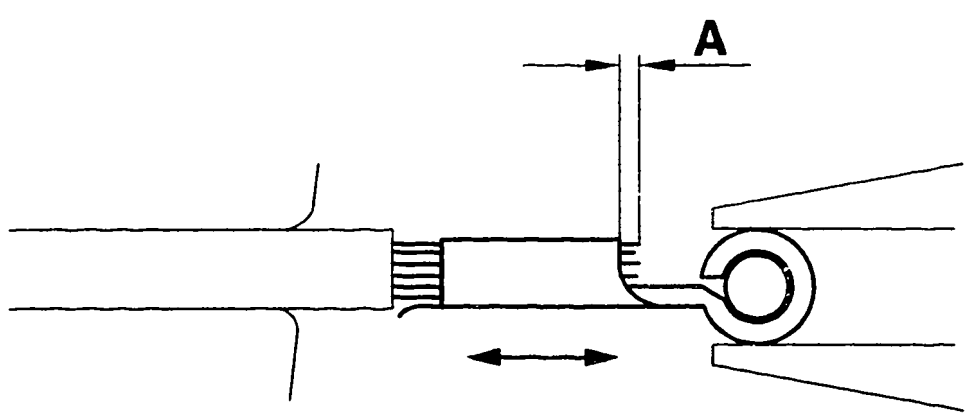
CHECKING POSITIONER COVER

Contact plate, leads, soldered joints:

When the lead is moved, there must not be any change in the length of the end of the stranded wire projecting over the crimp (dimension A, see picture). The connection is defective if relative movement can be detected between end of stranded wire and crimp. The appropriate component is to be replaced if the crimp is loose. Refer to repairing positioner cover, coordinate: B22/1
Recrimping or soldering in the area of the crimp is not permitted.

Continue: B19/1 Fig.: B18/2

KMK04056



CHECKING POSITIONER COVER

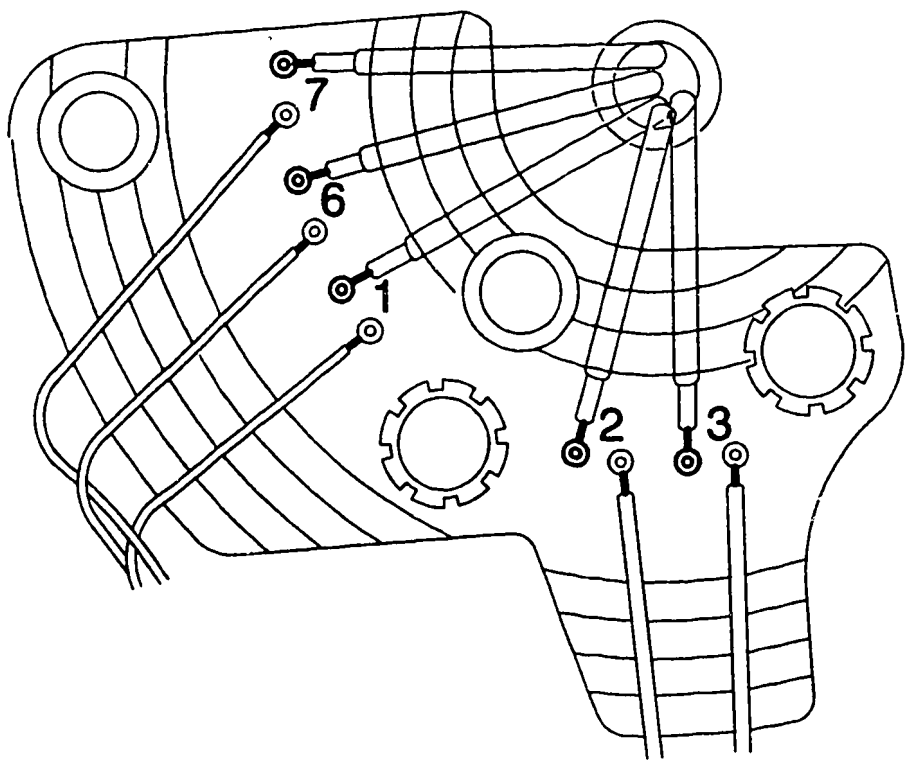
Component resistance measurements at soldered joints of contact plate:

1–6 (green–red)
RPS coil 1: 17...23 Ohm
7–6 (black–red)
RPS coil 2: 17...23 Ohm
1–7 (green–black)
RPS total: 34...46 Ohm
2–3 (brown–brown/white)
Servo magnet: 0.55...0.90 Ohm

Replace defective component; refer to repairing positioner cover, coordinate: B22/1

Continue: B20/1 Fig.: B19/2

KMK04551

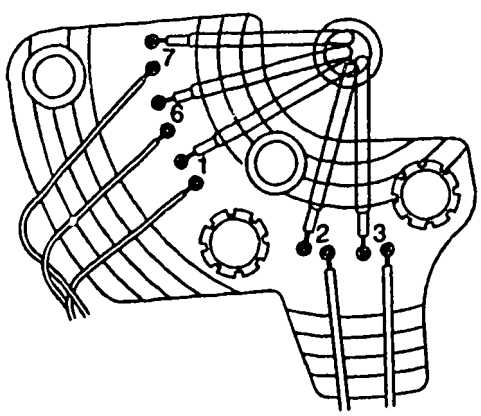


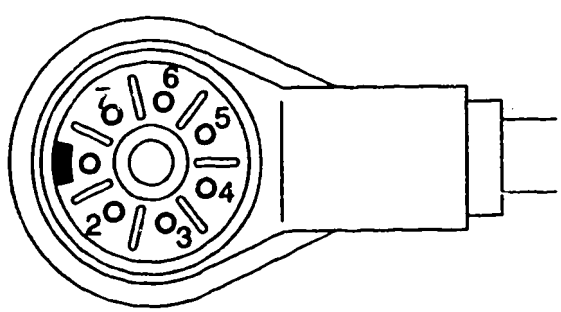
CHECKING POSITIONER COVER

Check leads of connecting wire from contact plate to Kostal plug for continuity and mutual short circuit. In doing so, move lead near plug to detect any loose contacts.
The contact numbers on the contact plate and plug are the same; pins 4 and 5 of the plug are not used.
Test specifications:
Continuity test: 0 Ohm.
Short circuit: infinity Ohm.
Note on short-circuit test: When checking the leads for the same component, the value is not infinity Ohm, but rather in line with the coil resistance of the component.

Continue: B21/1 Fig.: B20/2

KMK04552





CHECKING POSITIONER COVER

Additionally examine condition of cable bushing and connecting lead with Kostal plug to establish any mechanical damage as well as checking plug contact pins for corrosion and erosion.

If necessary, replace entire connecting lead with plug. Refer to repairing positioner cover,
coordinate: B22/1

Continue: B27/2

REPAIRING POSITIONER COVER

Table of contents for individual repair operations:

Continue: B22/2

REPAIRING POSITIONER COVER

General:

All components in the positioner cover are available as service parts and can be replaced separately.

When doing so, always pay attention to the repair instructions outlined in the following. This applies not only to the assembly instructions, but also to the detailed instructions regarding proper soldering and positioning of the leads at the pins of the contact plate.

Continue: B23/1

REPAIRING POSITIONER COVER

Replacing servo magnet:
Rack position sensor must be detached beforehand; if may also be necessary to unsolder the RPS leads.

Unscrew cover plate of contact plate (3 screws) to provide access to soldering pins.

Fold back cover plate.
Unsolder magnet connecting leads at pins 2 and 3.
For description of soldering procedure refer to coordinate: C06/1

Continue: B23/2

REPAIRING POSITIONER COVER

Unscrew fastening screws and replace magnet complete with flange plate.

Only dry magnet cleaning (e.g. armature and bore) is permitted; cleaning fluid is never to be used.
In the case of reusable and new servo magnets thoroughly lubricate armature and bore with oil SAE 20W20 prior to installation.
On installation, pay attention to coordinates for:

Soldering on of leads:	C06/1
Installation of RPS:	B25/1

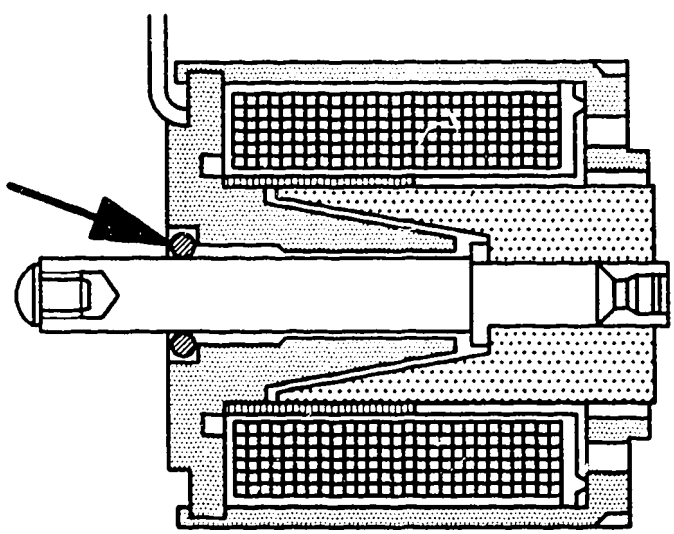
Continue: B24/1

REPAIRING POSITIONER COVER

Note on new servo-magnets:

New servo-magnets feature an O-ring (arrow) in a groove in the area of the small bearing bore for the armature thrust pin to stop the armature dropping out. This O-ring must be removed before fitting a new servo-magnet. The required freedom of magnet movement is not obtained with the O-ring in position.

Continue: B22/1 Fig.: B24/2



KMK02236

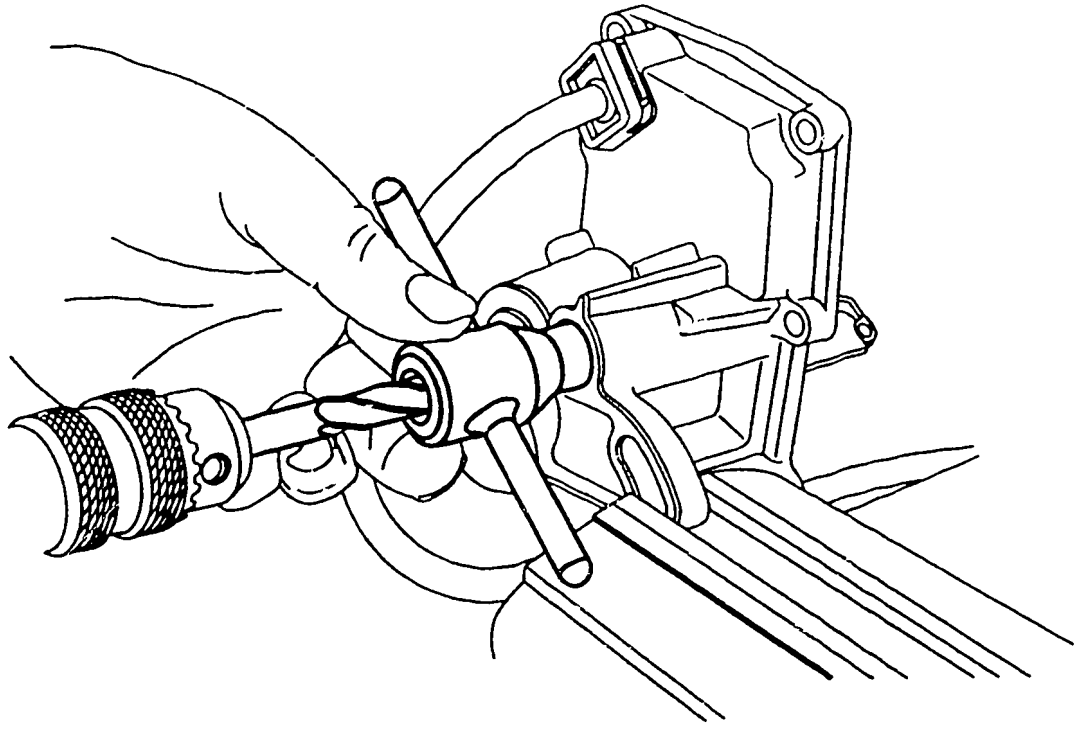
REPAIRING POSITIONER COVER

Replacing RPS:

The RPS fastening screw (clamping screw) is accessible from outside through a hole. This hole is provided with a seal (plastic plug) to prevent tampering.
The seal can be removed by drilling it out with a 12 mm bit; this destroys the seal.
In doing so, secure seal with pin-type socket wrench 0 986 611 459 (KDEP 2990) to stop it turning.
Drill at low speed and take care not to exert excessive force.
Following penetration, extract drill immediately to stop tip catching.

Continue: B26/1 Fig.: B25/2

KMK04553



REPAIRING POSITIONER COVER

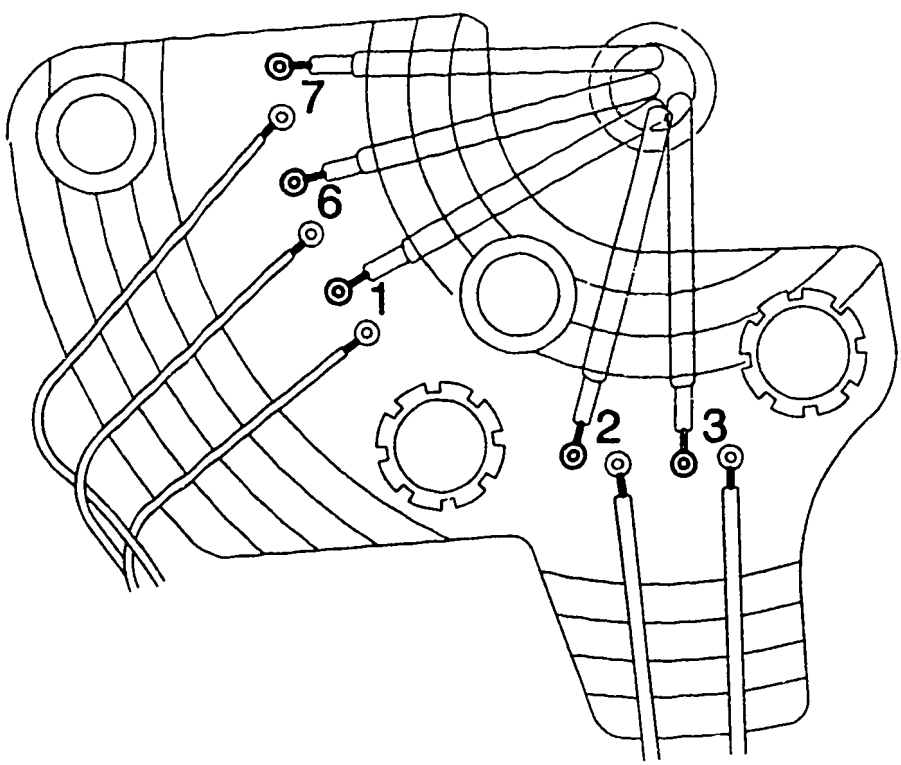
Removing RPS:

Unscrew cover plate of contact plate (3 screws) to provide access to soldering pins.
Fold back cover plate.
Unsolder RPS connecting leads at soldering pins 1, 6 and 7.

For description of soldering procedure see coordinate: C06/1

Continue: B27/1 Fig.: B26/2

KMK04551



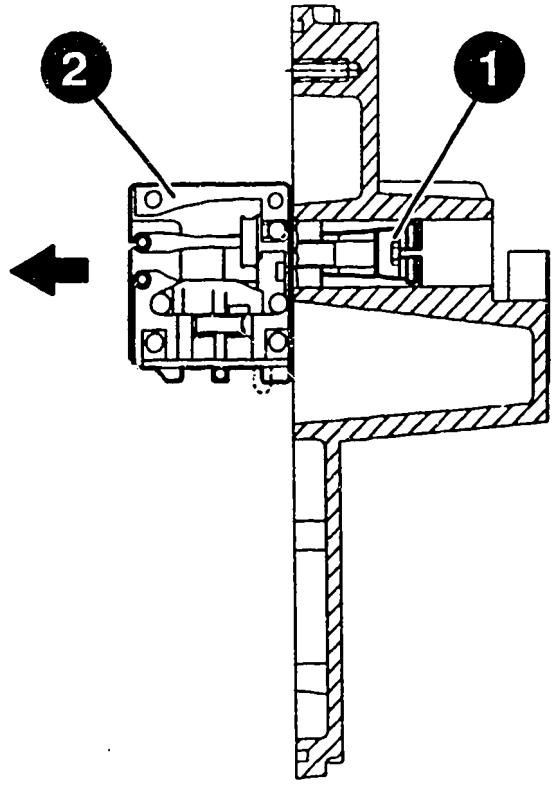
REPAIRING POSITIONER COVER

Removing RPS:

Loosen RPS clamping screw (1, hexagon socket 5 mm) and pull RPS (2) out of mounting hole.

Continue: B28/1 Fig.: B27/2

KMK04554

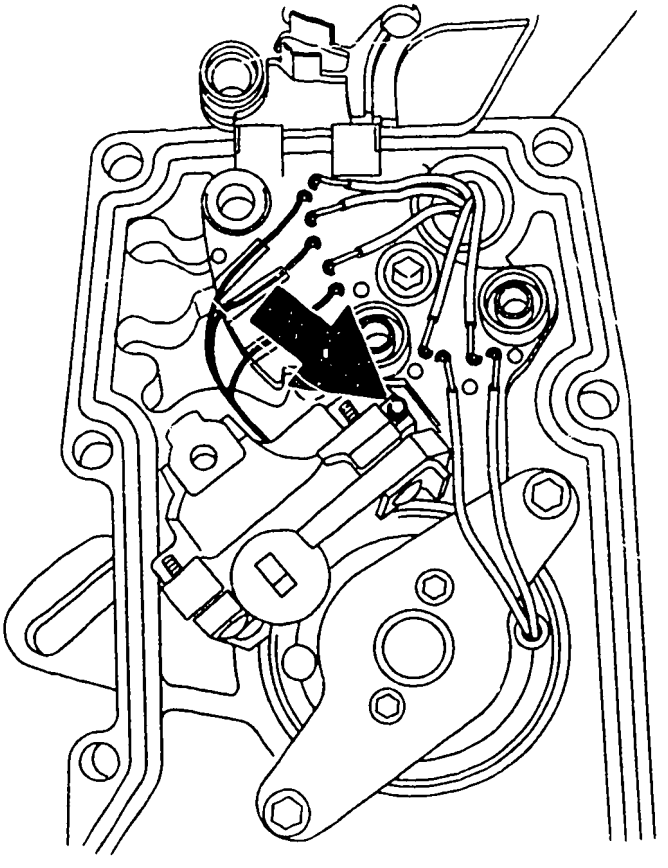


REPAIRING POSITIONER COVER

Note on new rack position sensor:
The tapered clamping screw is greased with Molycote grease. Ensure that periphery of clamping stem itself is free from grease. Do not screw in clamping screw with sensor removed, as otherwise clamping stem will be over-extended.

Insert rack position sensor as far as it will go, pay attention to guide in guide pin (arrow) and slightly tighten clamping screw.
For soldering on and laying of leads refer to Coordinate: C06/1

Continue: B22/1 Fig.: B28/2



KMK04555

REPAIRING POSITIONER COVER

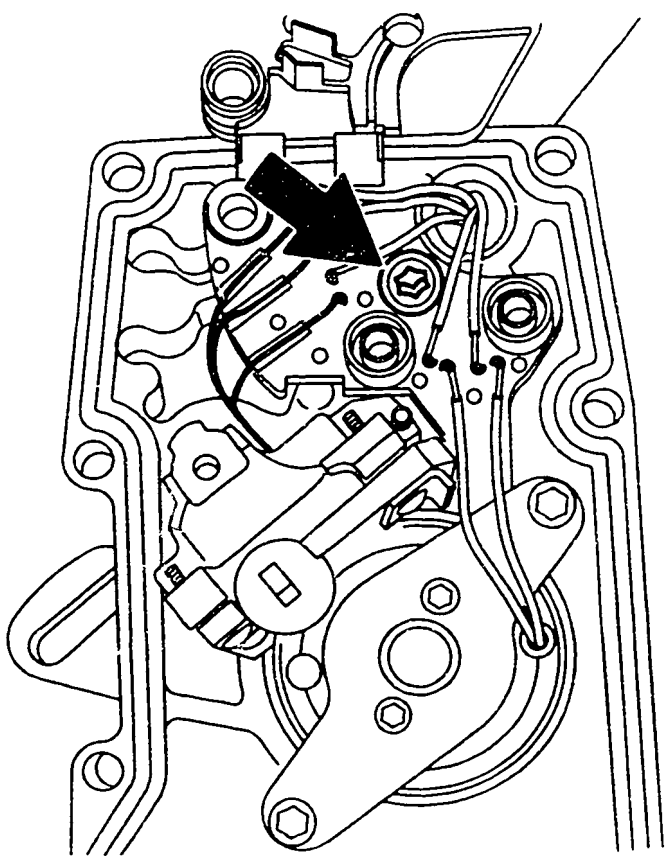
Replacing contact plate and/or connecting lead (with Kostal plug):

Unscrew cover plate of contact plate (3 screws) and fold back.

Unsolder all leads from servo magnet, RPS and connecting lead.
For description of soldering procedure refer to coordinate: C06/1

Screw out fastening screw (arrow) of contact plate and remove entire contact plate.

Continue: C02/1 Fig.: C01/2



KMK04556

REPAIRING POSITIONER COVER

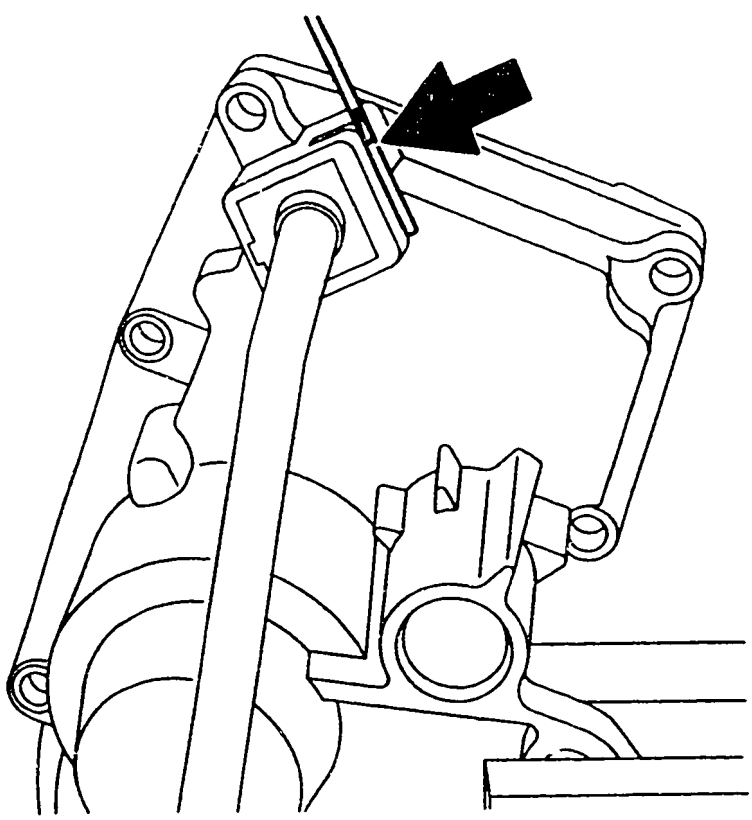
Replacing contact plate and/or connecting lead (with Kostal plug):

To remove connecting lead, use small screwdriver or pointed pliers to press outer clip of cable bushing (arrow) out of guide.

Pull entire connecting lead together with cable bushing out of positioner cover.

Continue: C03/1 Fig.: C02/2

KMK04557



REPAIRING POSITIONER COVER

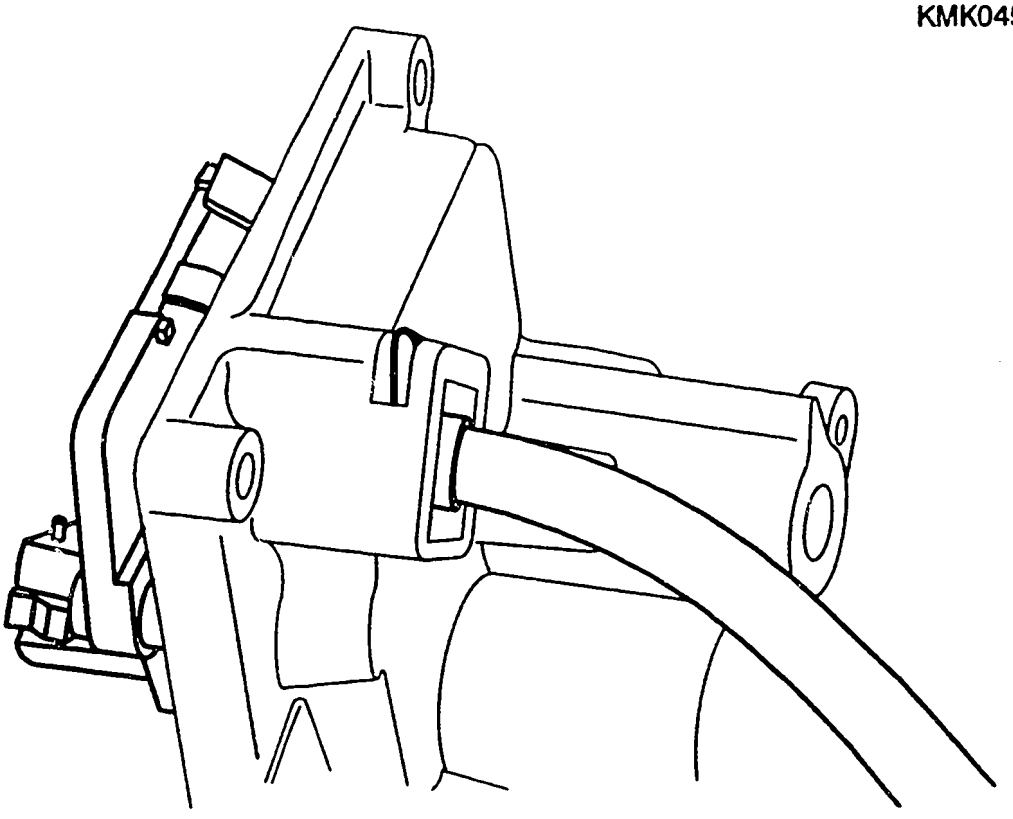
Replacing contact plate and/or connecting lead (with Kostal plug):

Insert new contact plate, tighten fastening screw to torque of 4...6 Nm.

Insert connecting lead into positioner cover such that cable bushing is flush on outside. Use new clip and press it as far as it will go into guide groove of cable bushing.

Continue: C04/1 Fig.: C03/2

KMK04558



REPAIRING POSITIONER COVER

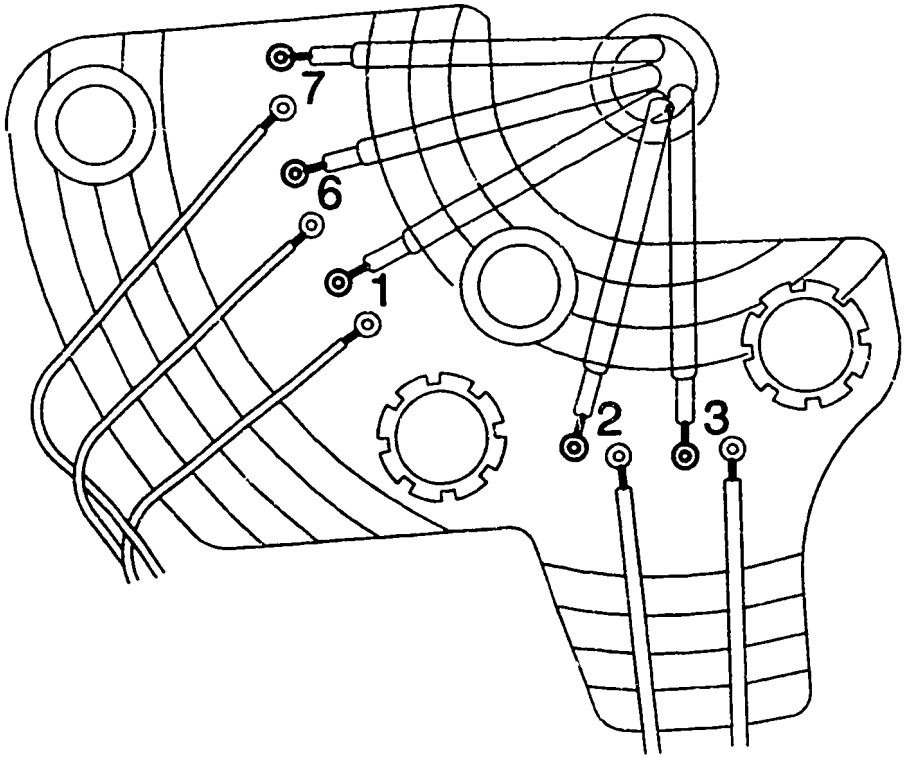
Replacing contact plate and/or connecting lead (with Kostal plug):

Solder on individual component leads and connecting lead as shown in fig.
Colour coding:
1=green-green 2=brown-black
3=brown/white-black 5=red-red
7=black-black
Soldering specification, see coordinate: C06/1

Insert all leads in cable ducts of contact plate.

Continue: C05/1 Fig.: C04/2

KMK04551



REPAIRING POSITIONER COVER

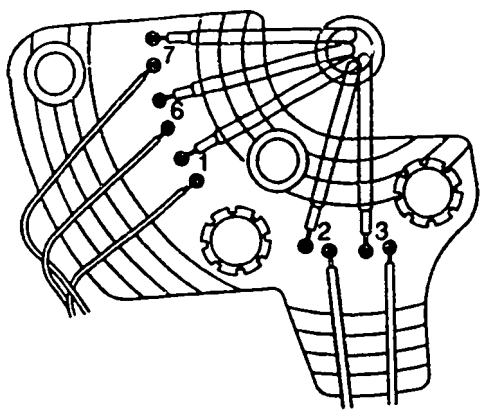
Replacing contact plate and/or connecting lead (with Kostal plug):

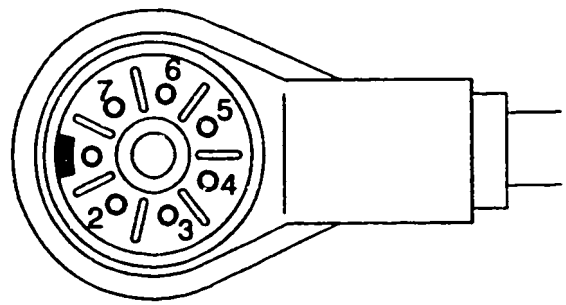
Check leads from contact plate to Kostal plug for continuity and proper connection using ohmmeter. Contact numbers of plug and contact plate are identical. Plug pins 4 and 5 are not used.
Set value, continuity test: 0 Ohm.

Fit cover plate of contact plate and tighten the three screws to torque of 5...7 Nm.

Continue: B22/1 Fig.: C05/2

KMK04552





REPAIRING POSITIONER COVER

Soldering specification for leads at contact plate:

Proper soldering of the leads to the plug plate is a prerequisite for proper, long-term functioning of the RE positioner.
Perform work such that there is no danger of contact resistances or breakage of connections caused by the considerable vibration acceleration at the positioner.

The operations described in the following are thus to be performed with extreme care.

Continue: C06/2

REPAIRING POSITIONER COVER

Demands made of soldering equipment:
* Temperature-regulated soldering iron
  - Soldering tip temperature 350... 370 degrees C, power approx. 50 W
  Recommendation:
  - Weller soldering station WTCP-S with
  - soldering iron TCP-S 24 V, 50 W
  - Soldering tip No. 7, long, tapered, 370 degrees C
* Soldering tin: With no bismuth or calcium
  e.g. DIN Sn60 Pb Cu2 or Sn63 Pb
* Recommended flux (solder cream):
  DIN F-SW 26 (2.5 %) or
  in USA: Type RMA 2...3 % QQ-S-571

Continue: C07/1

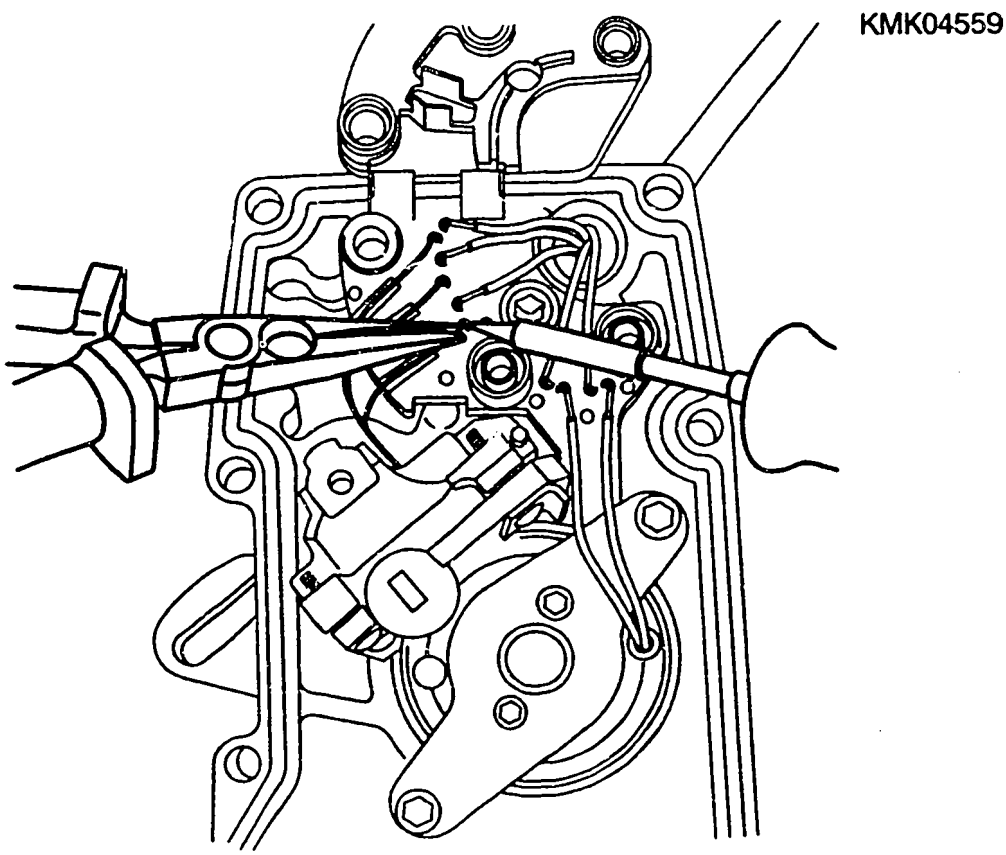
REPAIRING POSITIONER COVER

Soldering procedure:

Unscrew cover plate of contact plate (3 screws) to provide access to soldering pins.
Fold back cover plate (film hinges).

Clean solder connections of component concerned (e.g. with acetone).
Hold soldering iron against side of solder lug until soldering tin is liquid and remove solder lug from contact pin using small pointed pliers.
Caution: Take care not to bend contact pins (pre-damage).

Continue: C08/1 Fig.: C07/2



REPAIRING POSITIONER COVER

New components are supplied with leads of correct length and with crimped-on solder lugs. The leads are not to be modified in any way.

If a new contact plate is fitted, the area to be soldered on the soldering pins is to be cleaned mechanically (fine sandpaper) and with a cleaning agent (e.g. acetone) and then pre-tinned.

Continue: C08/2

REPAIRING POSITIONER COVER

Installation position of solder lugs and soldering procedure:

The position of the solder lugs is arbitrary (opening on left or right).
Solder lug, crimp and lead in cable duct must be in alignment.
A small quantity of solder cream can be applied to the pins.
Attach new solder lugs such that they are flush with pin at top. Warm side of lug until soldering tin is drawn in. Attach reusable solder lugs, warm until soldering tin becomes liquid and then press down until solder lug and pin are flush.

Continue: C09/1

REPAIRING POSITIONER COVER

Installation position of solder lugs and soldering procedure:

Note:

* Solder lug and soldering pin flush. No contact between plastic of contact plate and solder lug or soldering tin.
* Do not apply too much soldering tin; do not allow it to get into the area of the crimp.
* Do not heat solder joint for too long a period so as to minimize overall warming in soldering-pin area and at leads.

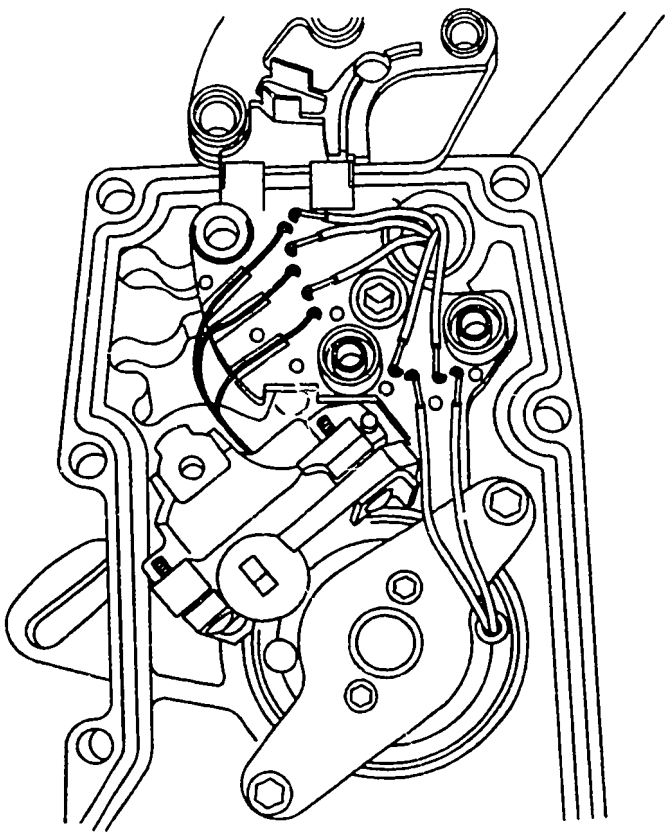
Continue: B22/1

REPAIRING POSITIONER COVER

Laying of leads:

Press all leads fully into cable ducts. Place cover plate in position on contact plate and tighten the three fastening screws to a torque of 5...7 Nm.

Continue: N27/2 Fig.: C10/2



KMK04550

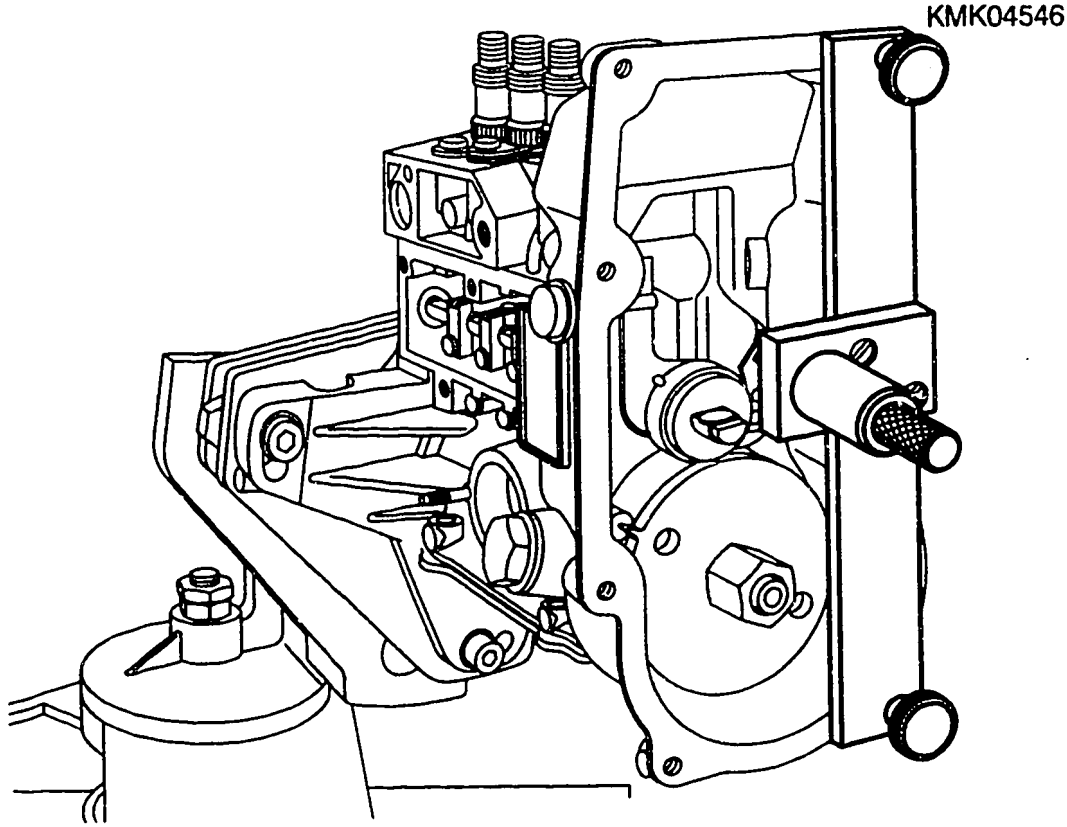
POSITIONER ASSEMBLY

Before attaching positioner cover to positioner housing, use assembly gauge 0 986 612 590 (KDEP 1909) to check position of RPS short-circuiting ring at control rod.

This is necessary, since freedom of movement of the control rod after assembly of the positioner cover is only guaranteed if the short-circuiting ring is correctly positioned.

Refer to following coordinates for procedure involved.

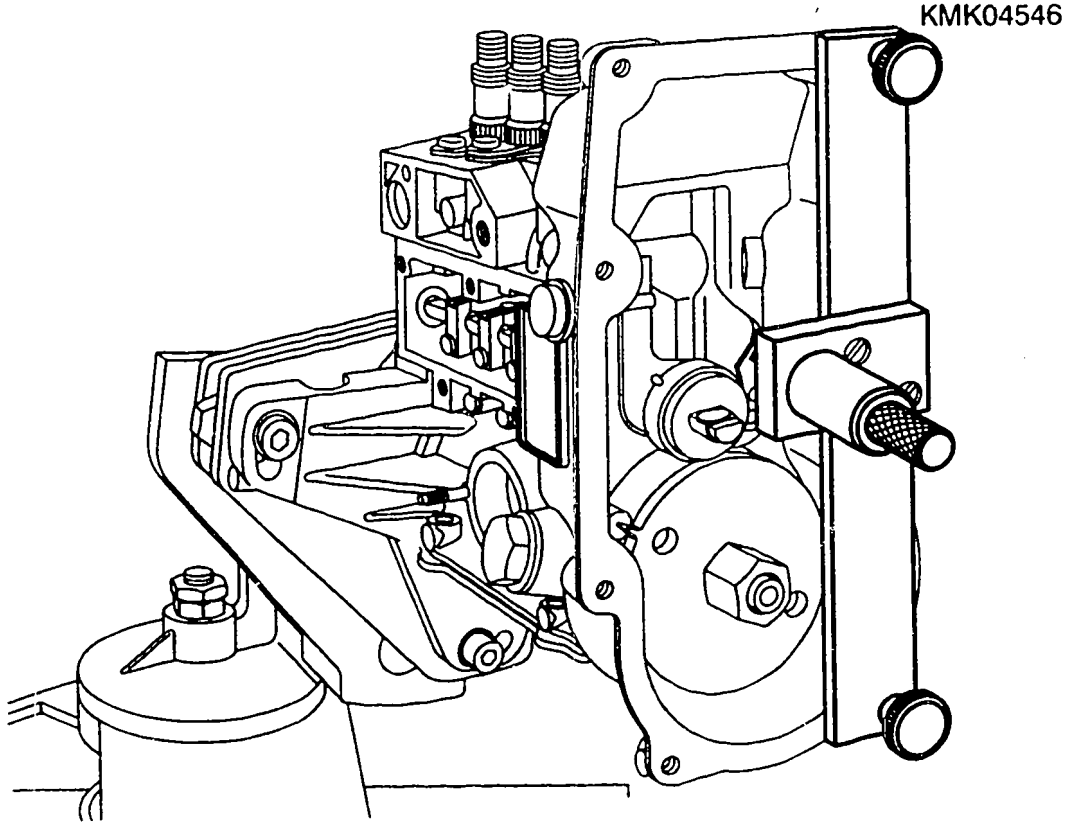
Continue: C12/1 Fig.: C11/2



POSITIONER ASSEMBLY

Screw assembly gauge with retracted measurement pin into right-hand tapped holes of housing using the appropriate knurled screws.

Continue: C13/1 Fig.: C12/2



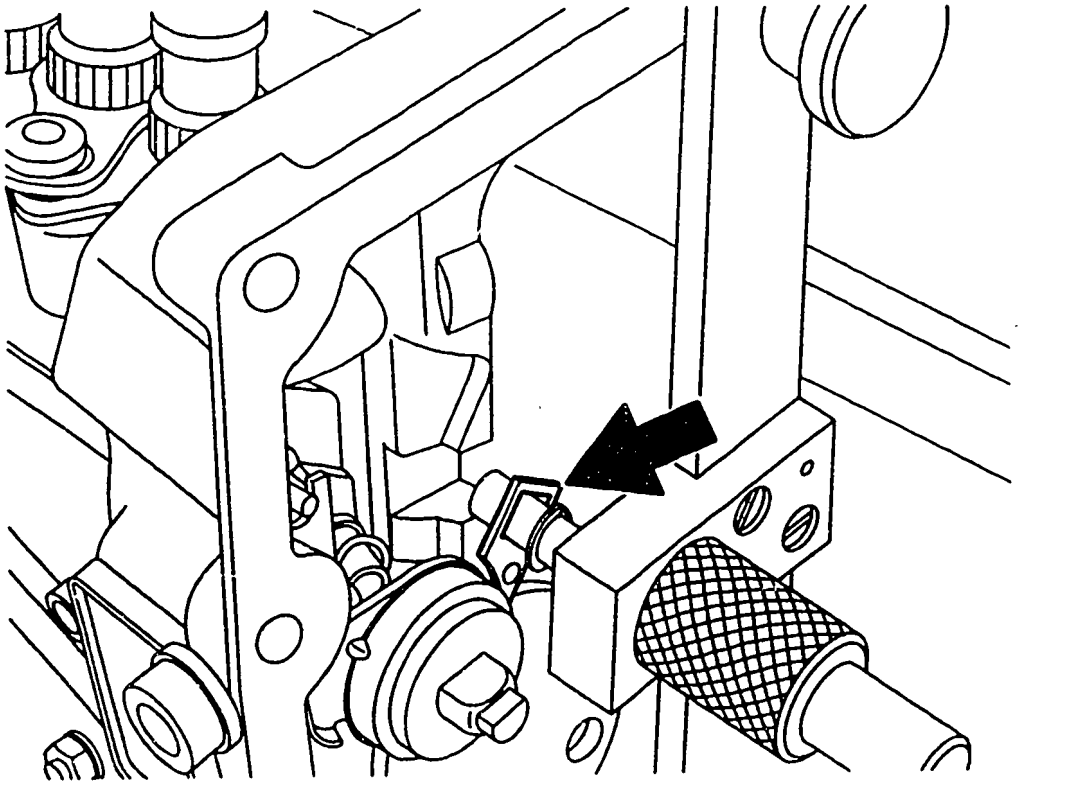
POSITIONER ASSEMBLY

It must now be possible to insert the smallest diameter of the measurement pin of the assembly gauge into the short-circuiting ring without exerting any force (arrow).

If the position of the short-circuiting ring does not correspond to that of the assembly gauge, replace control rod, i.e. disassemble fuel-injection pump.

Continue: C14/1 Fig.: C13/2

KMK04547

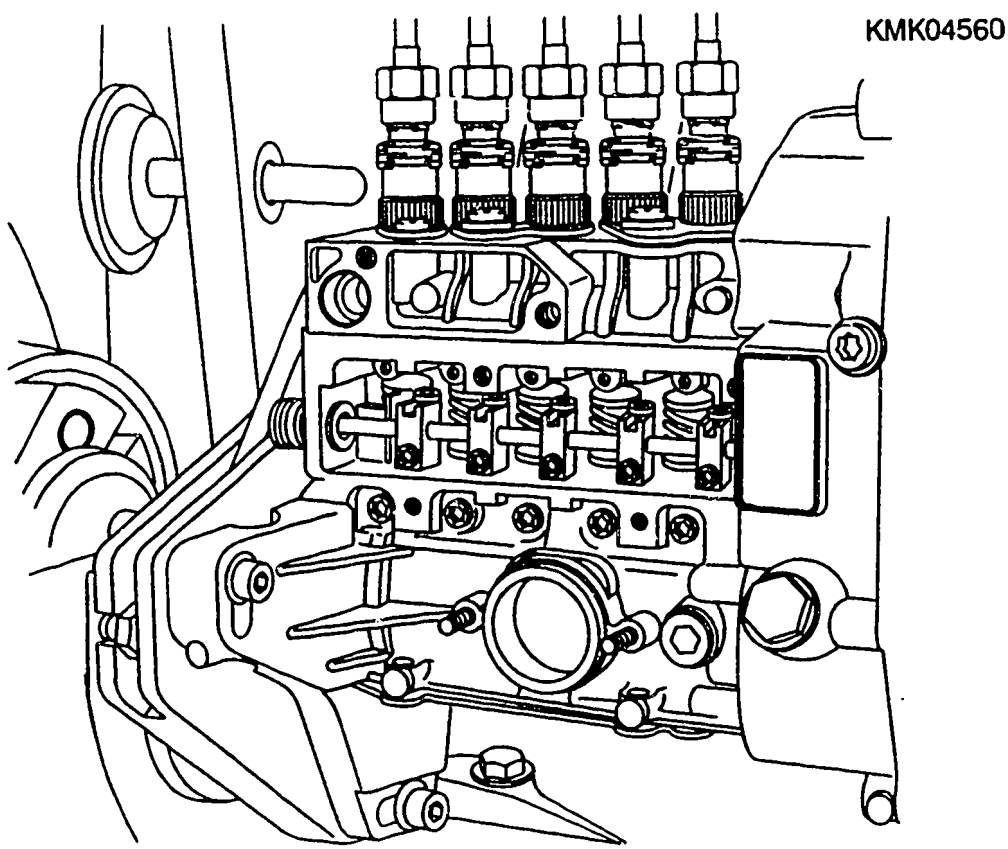


POSITIONER ASSEMBLY

For further assembly, mount fuel-injection pump on injection-pump test bench. The procedure to be employed is the same as for pumps with mechanical governor; refer to appropriate test instructions. Test equipment is listed in test specification sheet.

Calibrating-oil connections for M-pumps with plug connections are to be made with the aid of the connection parts set 1 687 010 083 (EPS 912). Method of connection and selection of the necessary components are described in detail in the following sections relating to checking of start of delivery, injected quantity and EHAB.

Continue: C15/1 Fig.: C14/2

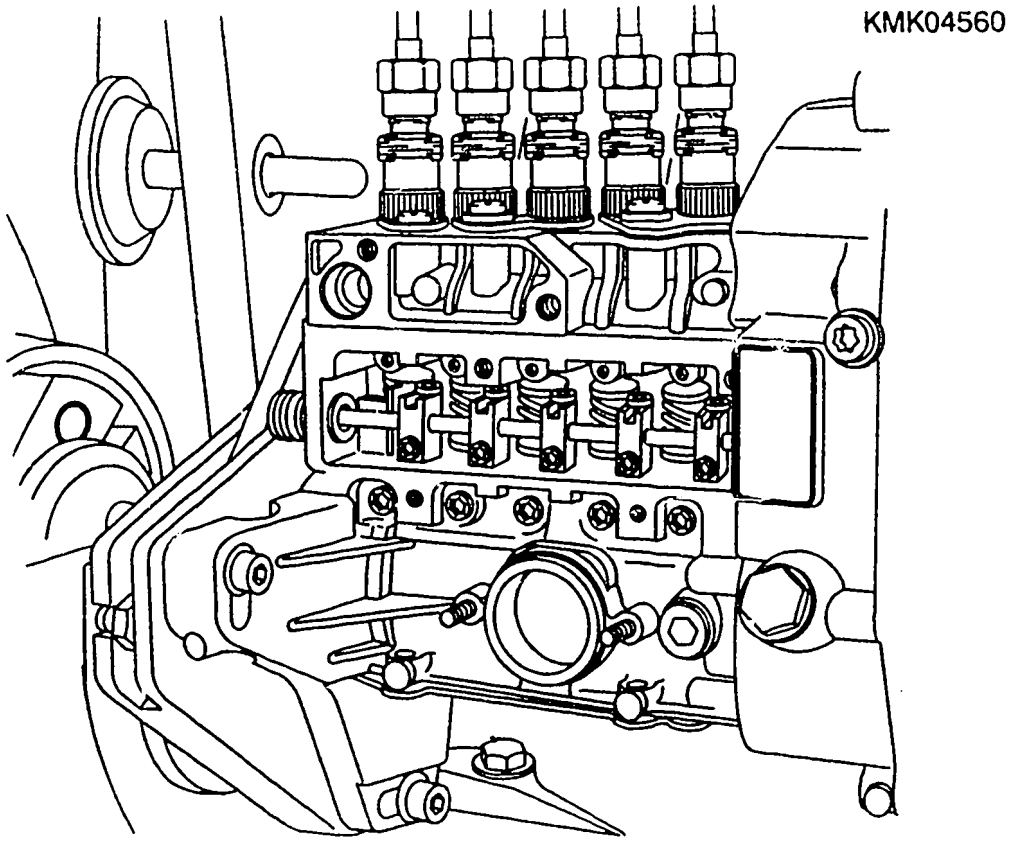


POSITIONER ASSEMBLY

If still to be done:
Remove EHAB, supply pump and closing cover of spring chamber.

Perform checking/adjustment of start of delivery in sequence described below. This is a prerequisite for subsequent installation and precise setting of the start-of-delivery toothed disk.

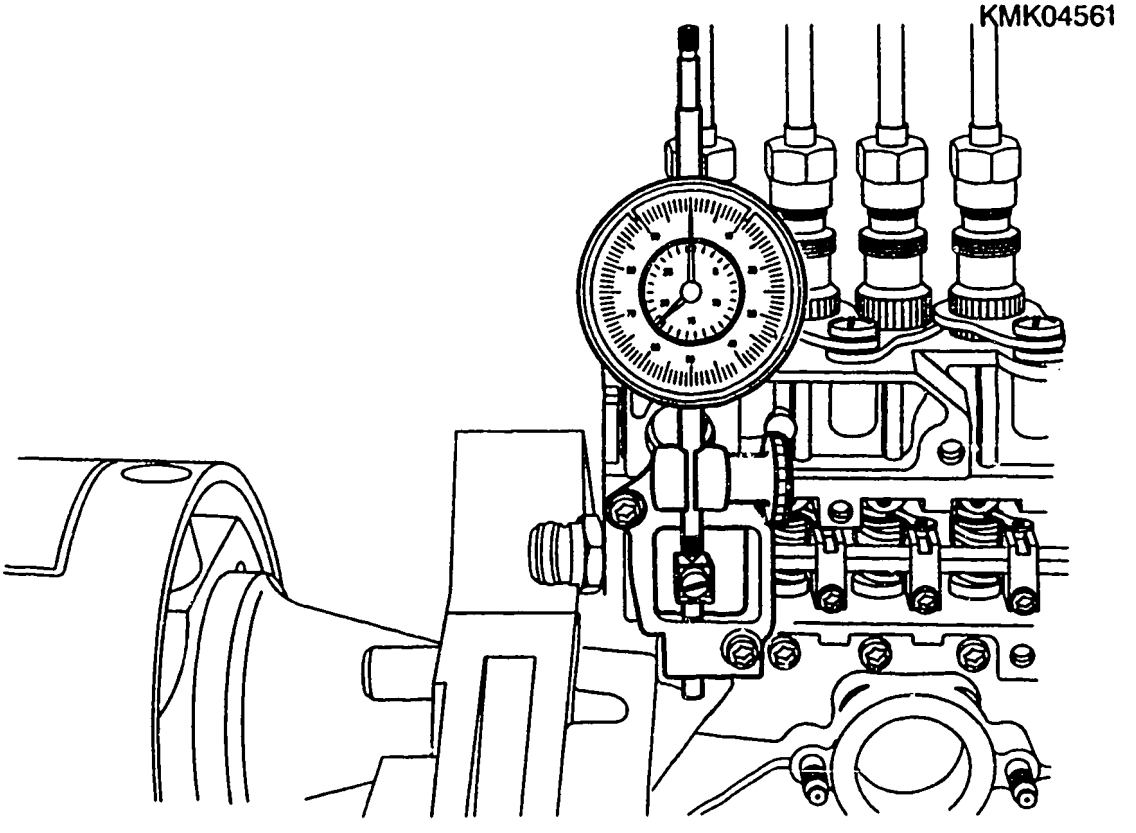
Continue: C16/1 Fig.: C15/2



POSITIONER ASSEMBLY

By turning camshaft in direction of rotation, set roller tappet of start-of-delivery adjustment cylinder (cylinder 1) to UT.
Mount prestroke measuring device 0 681 440 G17 (reworked as indicated on coordinate A17/1) on adjustment cylinder. Set dial indicator in UT position to 0.
Set adjustment cylinder to prestroke as per test specification sheet (mean value) and move pointer of test-bench graduated disk to 0 or theoretically favorable initial value. Remove prestroke measuring device without further altering pointer.

Continue: C17/1 Fig.: C16/2



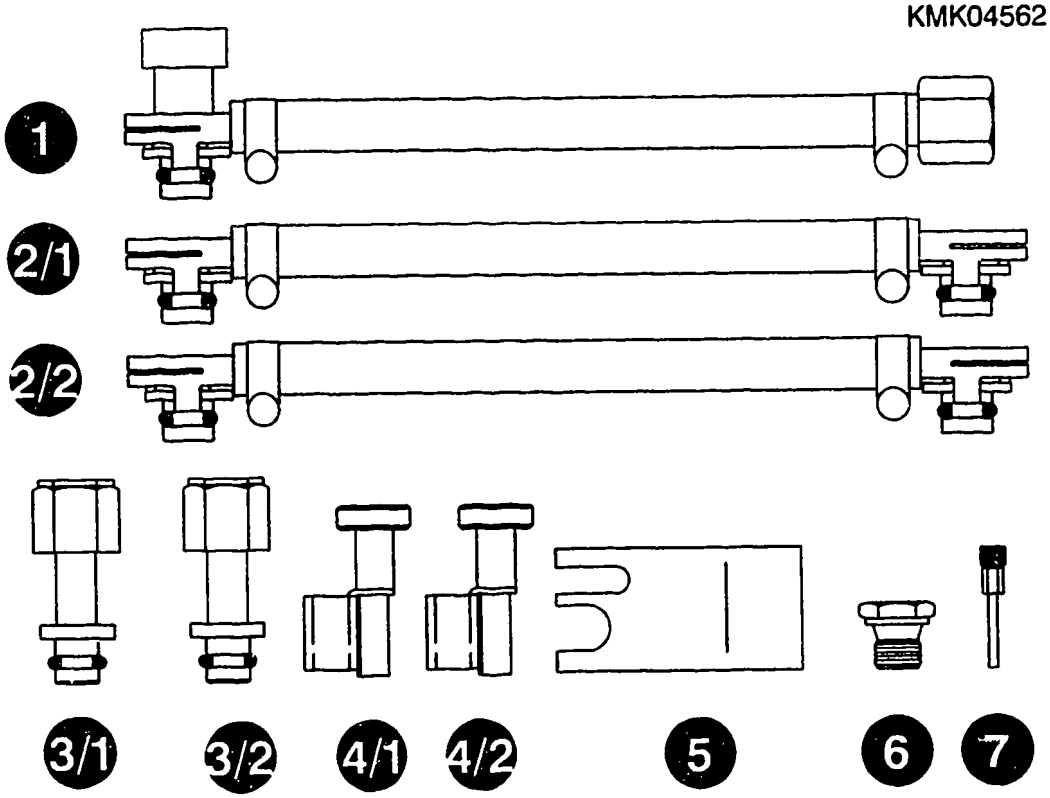
POSITIONER ASSEMBLY

Testing start of delivery:
Make calibrating-oil connection for testing start of delivery with the aid of the appropriate connection parts in the connection set 1 687 010 083 (EPS 912):

Parts set, complete:
1 = Hose with overflow valve
2/1, 2/2 = Hoses
3/1, 3/2 = Connections
4/1, 4/2 = Clamping pieces
5 = Retaining plate
6 = Screw plug
7 = Coupling pin (for CRT measuring device)

Continue: C18/1 Fig.: C17/2

KMK04562



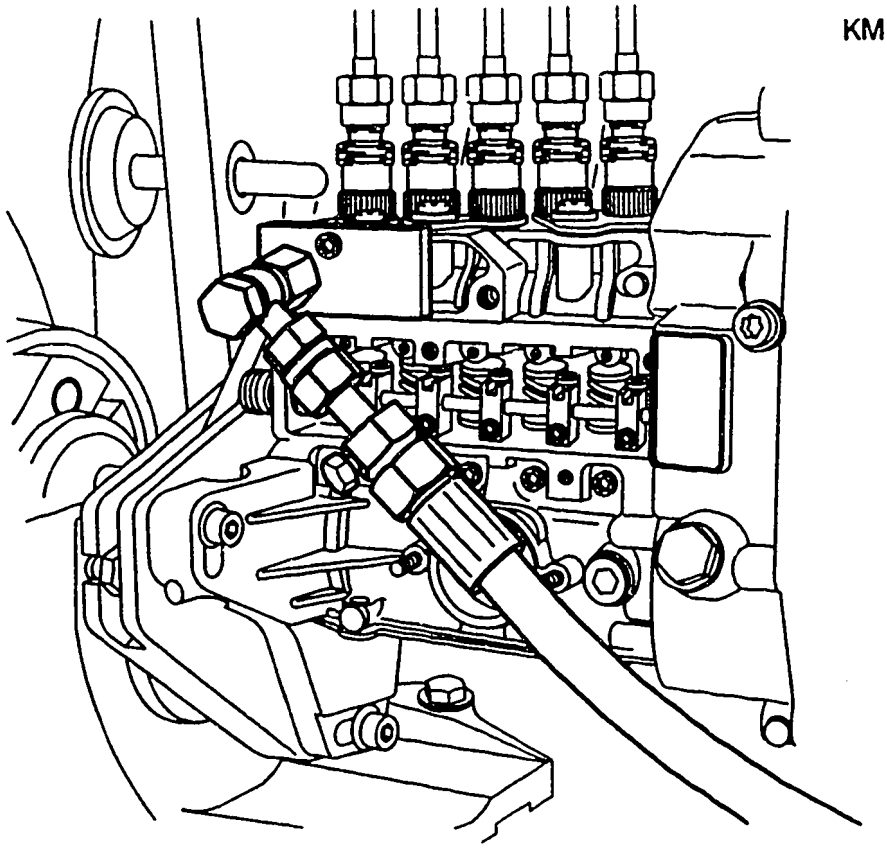
POSITIONER ASSEMBLY

Calibrating-oil connection for testing start of delivery:

Insert connection 3/1 in inlet bore in suction chamber (at EHAB flange) and secure with retaining plate 5 and one of the EHAB screws.
Use inlet union screw to attach calibrating-oil inlet line to connection.

Insert connection 3/2 in return connection on back of suction chamber, secure with clamping piece 4/1 and seal with screw plug 6.

Continue: C19/1 Fig.: C18/2



KMK04563

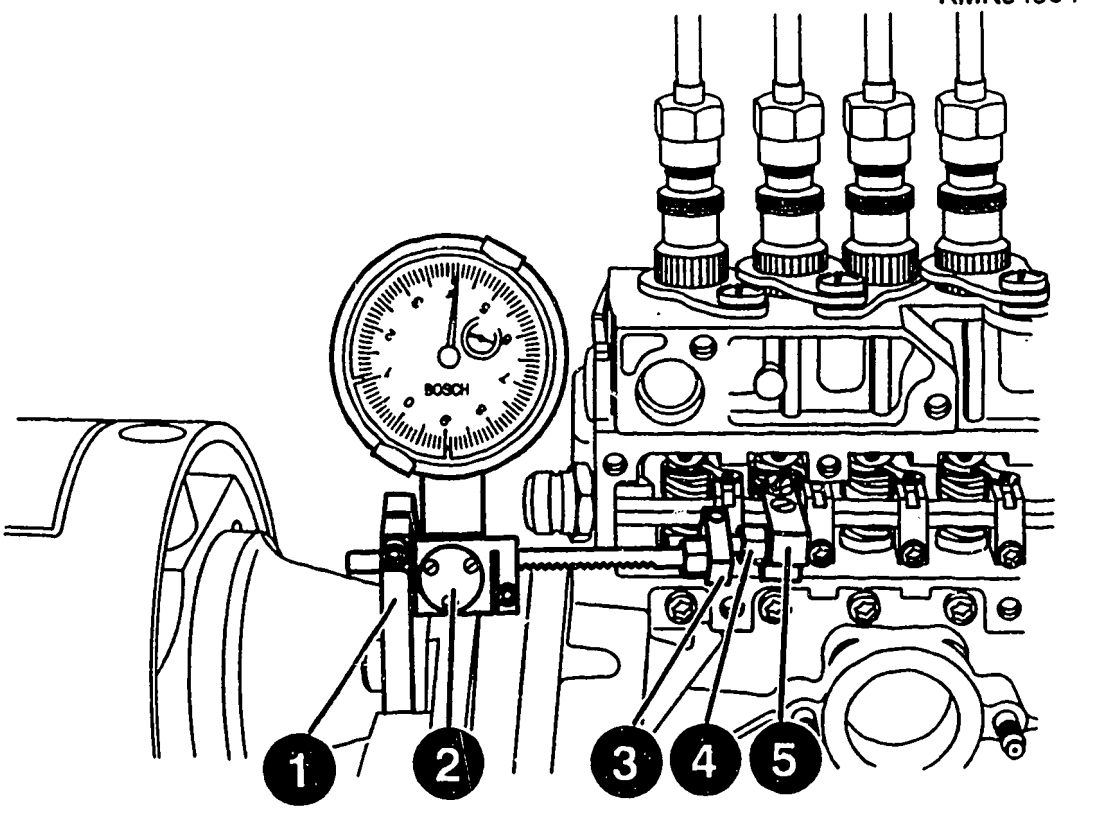
POSITIONER ASSEMBLY

Press off closing cap for control rod on drive end.
Attach CRT measuring device 1 688 130 130 with accessory set 1 687 000 053 and coupling pin 1 683 527 066 (see picture).

1=Support clamp	from 1 688 130 130
2=Dial indicator	from 1 688 130 130
3=Coupling piece	from 1 687 000 053
4=Coupling pin connection set	from 1 687 010 083
5=Clamping piece	from 1 688 130 130

Continue: C20/1 Fig.: C19/2

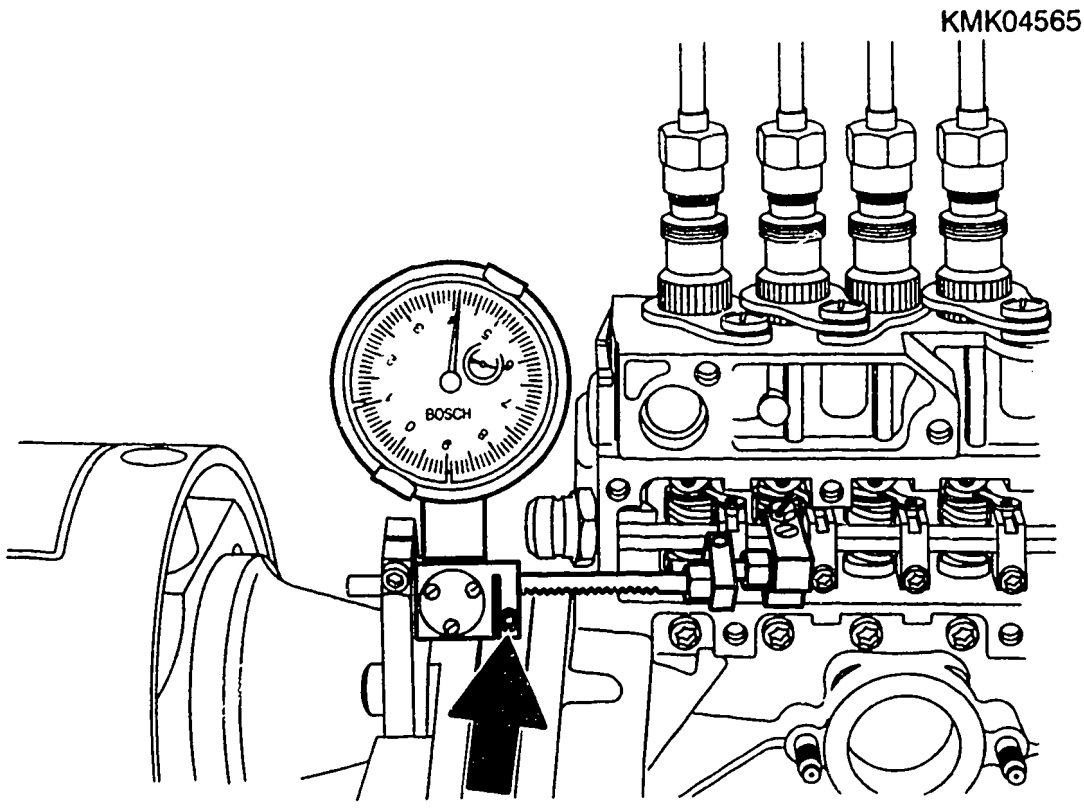
KMK04564



POSITIONER ASSEMBLY

Set CRT measuring device in shutoff position of control rod to 1 mm CRT. Then set control rod to prescribed CRT for checking start of delivery as per test specification sheet (can be moved by hand at clamping pieces of control rod) and block at CRT measuring device (arrow).

Continue: C21/1 Fig.: C20/2



POSITIONER ASSEMBLY

Perform start-of-delivery test and make any necessary correction to "prestroke" in line with existing test instructions for M-pumps.

Then set adjustment cylinder exactly to start of delivery (endeavour to obtain mean value).

Continue: C22/1

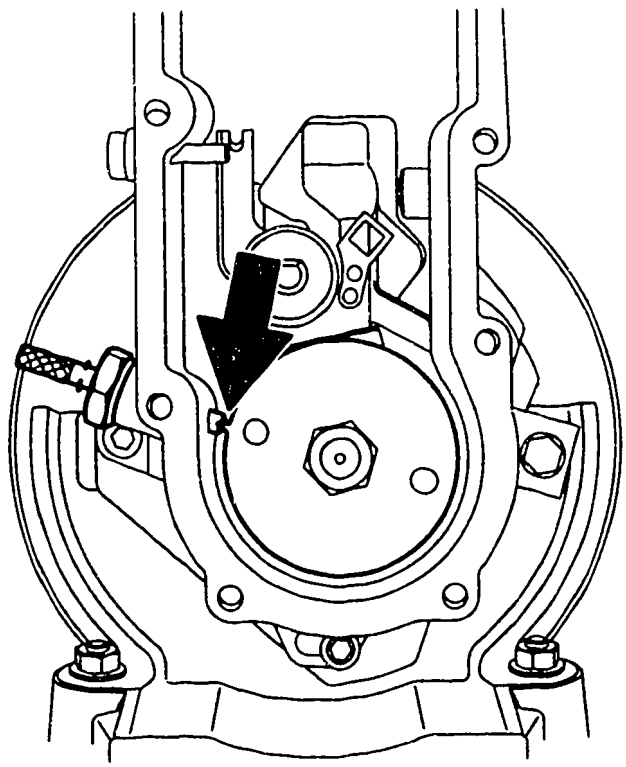
POSITIONER ASSEMBLY

Fitting and adjusting start-of-delivery toothed disk:
Attach cleaned toothed disk (dry in area of bore and grease-free) to camshaft spigot which has likewise been cleaned. Do not tighten fastening nut; it must be possible to turn the disk. Position start-of-delivery tooth of disk such that it coincides with start-of-delivery adjustment bore in housing.

Screw start-of-delivery blocking device 0 986 611 746 (KDEP 1077) into hole and precisely fix position of adjustment cam (arrow).

Continue: C23/1 Fig.: C22/2

KMK04566



POSITIONER ASSEMBLY

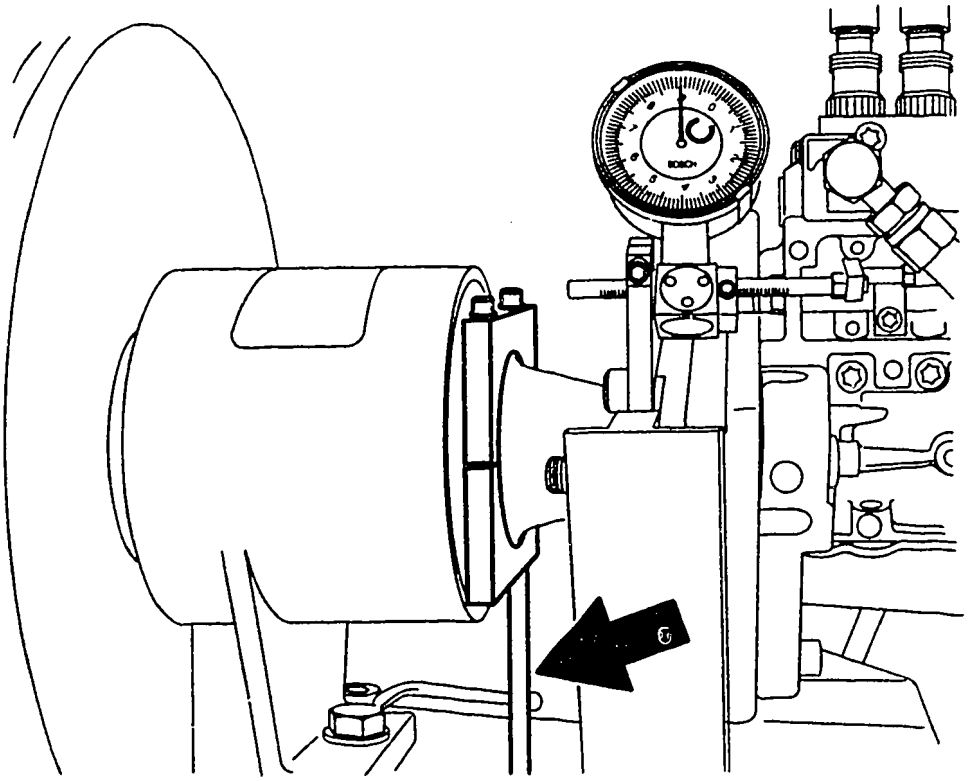
Block camshaft with the aid of the split camshaft blocking device 0 986 612 056 (KDEP 1545):

Attach blocking device to cylindrical part of drive coupling such that support pin rests on test-bench bed on left when viewed in direction of rotation (arrow).

Tighten clamping screws of device.

Continue: C24/1 Fig.: C23/2

KMK04567



POSITIONER ASSEMBLY

Provisionally tighten fastening nut of toothed disk to max. 2 Nm.

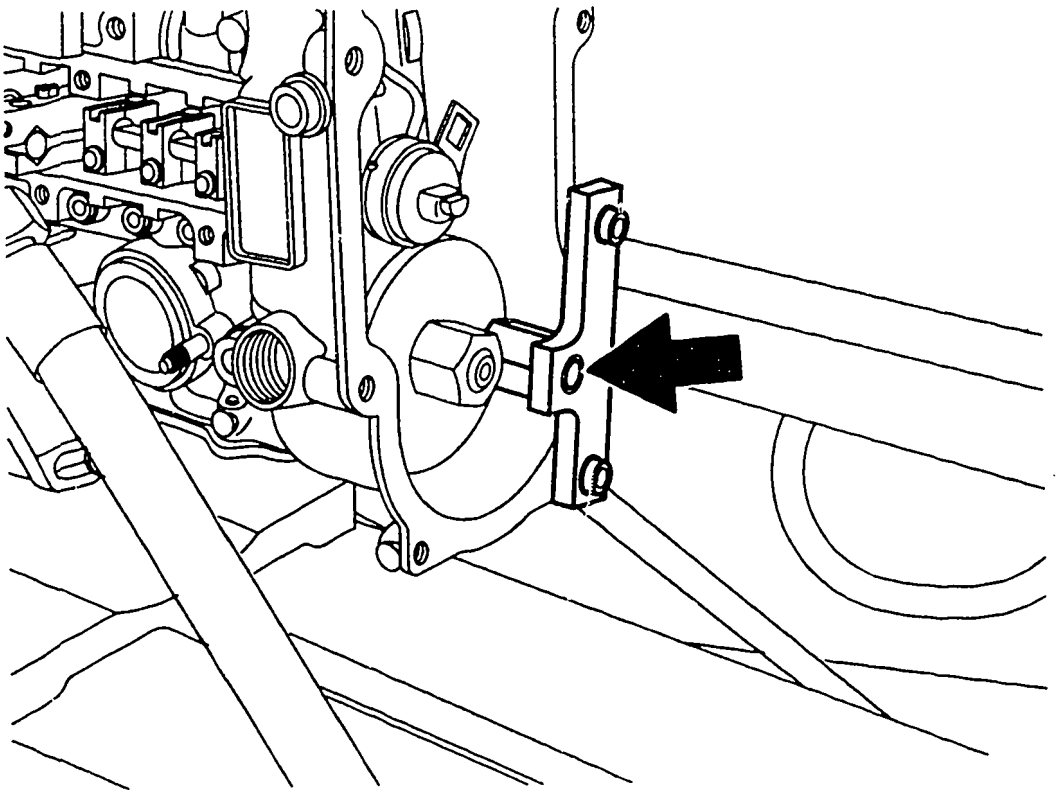
Screw out start-of-delivery blocking device. Insert lug of retainer 0 986 612 601 (KDEP 1912) (arrow) in hole in toothed disk and screw on at the two tapped holes on the bottom right of the housing.

Finally tighten fastening nut to torque of 65...75 Nm.

Remove camshaft blocking device and retainer.

Continue: C25/1 Fig.: C24/2

KMK04568



POSITIONER ASSEMBLY

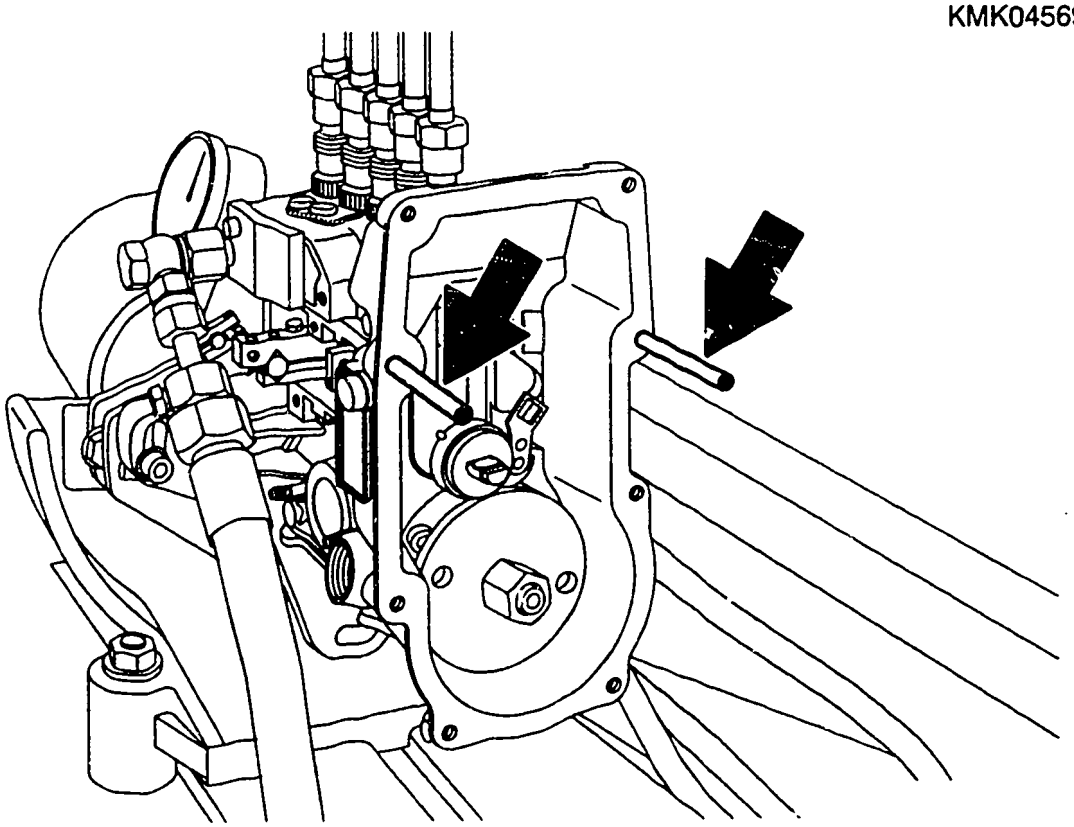
Fitting positioner cover:

Screw guide pins 0 986 612 598 (KDEP1910) as assembly aid into two opposite holes in housing.

Carefully position positioner cover with new seal (stick on with grease) in axial direction over guide pins. In doing so, insert measurement arm of RPS into short-circuiting ring of control rod without making contact. Press on positioner cover, screw screws into free holes and tighten slightly.

Continue: C26/1 Fig.: C25/2

KMK04569



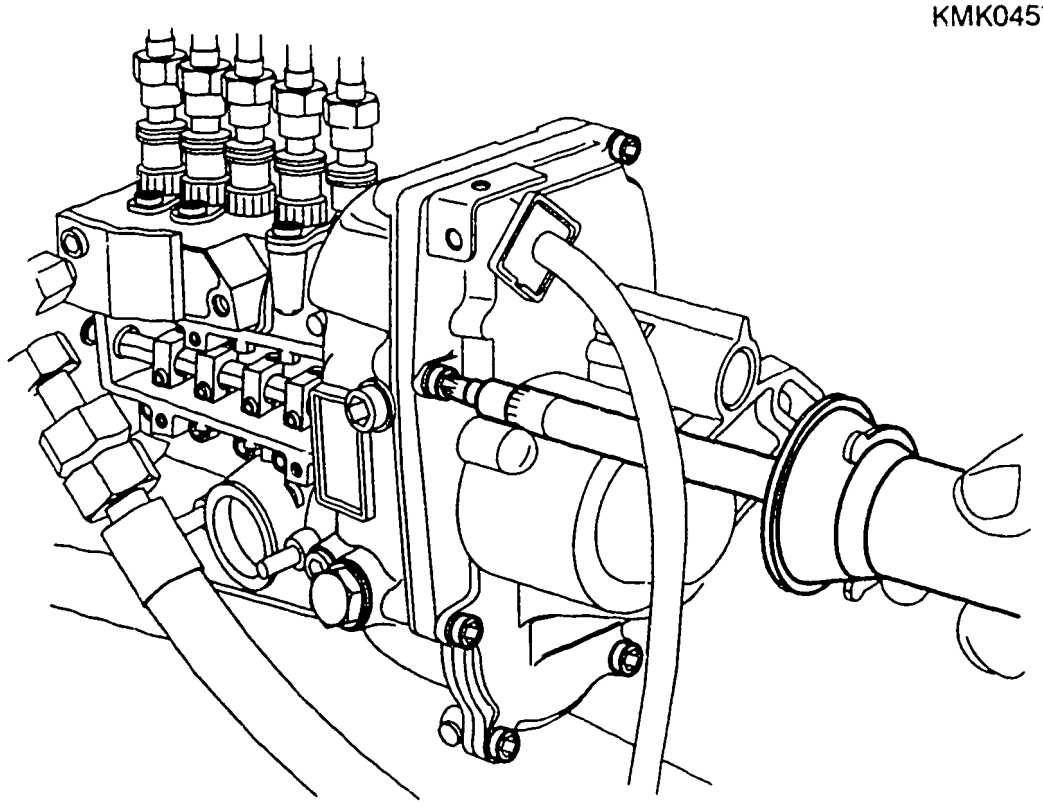
POSITIONER ASSEMBLY

Screw out the two guide pins and screw in the remaining screws.

Tighten all screws to torque of 5...7 Nm.

Continue: C27/1 Fig.: C26/2

KMK04570



POSITIONER ASSEMBLY

Positioner assembly work is thus completed. The pump remains on the test bench for subsequent checking/ adjustment of pump and positioner and the CRT measuring device is left in place.

The checking/adjustment instructions given in the following describe the procedure to be employed for new settings and for incoming inspections.

Continue: N27/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

The following instructions give a detailed description of all the operations required for the checking and adjustment of M-type fuel-injection pumps with RE positioner.

So as not to make these instructions unnecessarily long, there is no detailed description of operations which do not differ from those to be carried out on mechanically governed units, but rather mention is merely made of such operations at the appprop-riate points with supplementary notes being given in some instances.

This essentially applies to the following Sections:

Continue: D01/2

TEST AND ADJUSTMENT INSTRUCTIONS

Sections not described in detail:

* Mounting of fuel-injection pump on and connection to test bench.
* Selection of appropriate holding pieces and drive couplings.
* Operation of test bench.
* Testing and adjustment of prestroke, start of deliver, angular cam spacing and start-of-deliver mark.
* Start-of-delivery adjustment and equalization.

Reference is made in this respect to the corresponding, familiar documentation.

Continue: D02/1

TEST AND ADJUSTMENT INSTRUCTIONS

Additional instructions:

The basic prerequisite for the injected-quantity setting of the fuel-injection pump is precise adjustment of the rack position sensor in the positioner.

The sequence of operations in these test instructions is established in line with this stipulation.
It is always to be complied with if any work has been performed, e.g. repair work, on the positioner or fuel-injection pump.

Continue: D02/2

TEST AND ADJUSTMENT INSTRUCTIONS

Additional instructions:

On the other hand, the specified sequence is not to be complied with if an injection-pump assembly is only delivered for checking, e.g. warranty testing.

In such cases, the following sequence is to be employed:

Continue: D03/1

TEST AND ADJUSTMENT INSTRUCTIONS

1. Injected-quantity testing as described in these instructions, however no correction if values outside tolerance. The cause may be both incorrect injected-quantity adjustment and incorrect rack-position-sensor adjustment. Injected-quantity correction without knowledge of the rack-position-sensor setting could serve to worsen the fault.

Continue: D03/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

2. Check and, if necessary, adjust RPS.
   Quantity cannot be corrected until RPS is correctly set.

3. Perform quantity adjustment as is standard practice for M-pumps at clamping pieces on control rod.

Continue: D04/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

Incoming inspections:

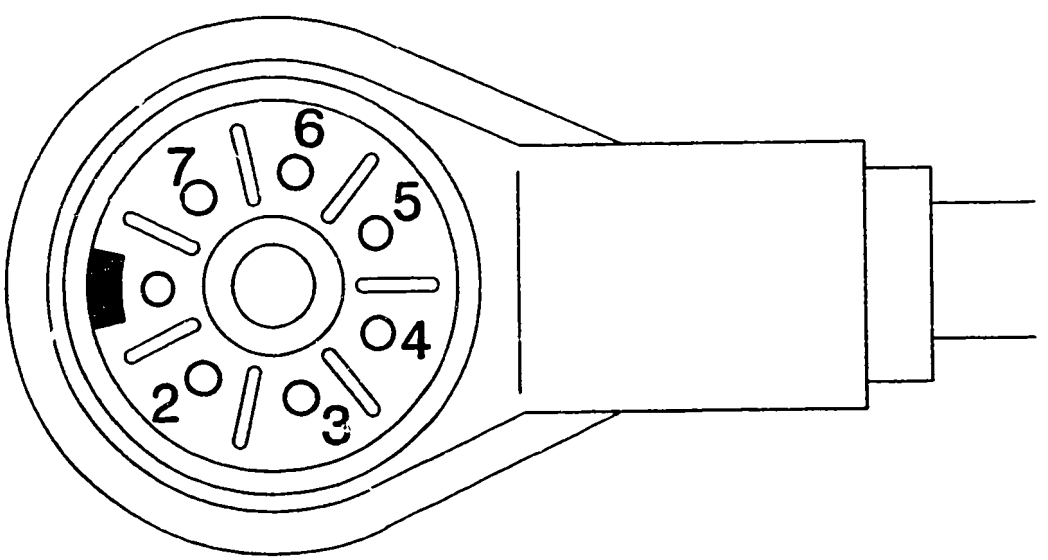
Resistance measurements at Kostal plug of connecting lead between contact pins:

1–6 (RPS coil 1) 17...23 Ohm
7–6 (RPS coil 2) 17...23 Ohm
1–7 (RPS total) 34...46 Ohm
2–3 (Servo magnet) 0.55...0.90 Ohm

Positioner must be repaired in the event of open circuit or incorrect value.

Continue: D05/1 Fig.: D04/2

KMK04571



CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB internal resistance
Pin 2(–) – 3(+) (right): 6.8...7.8 Ohm

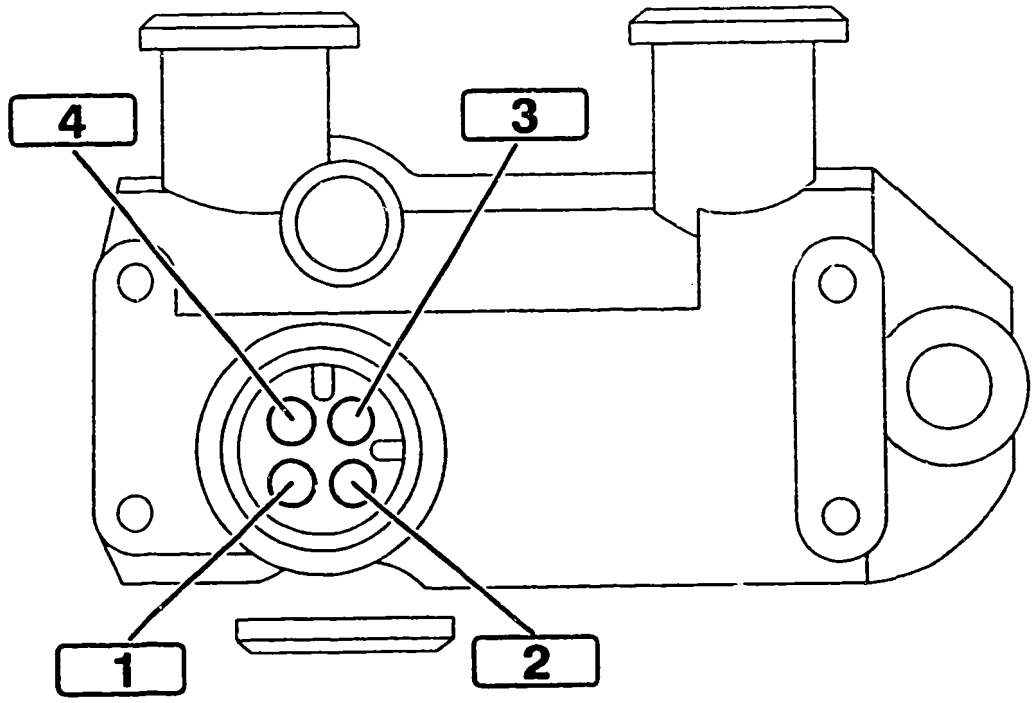
EHAB acoustic test:
Briefly apply 12 V
to EHAB: audible switching noise

Fuel temperature sensor
in EHAB (pin 1 – 4, left):
Resistance value at
calibrating–oil temperature
38...42 Grad C: 950...1400 Ohm

Incorrect values or no function:
Replace EHAB.

Continue: D06/1 Fig.: D05/2

KMK04572

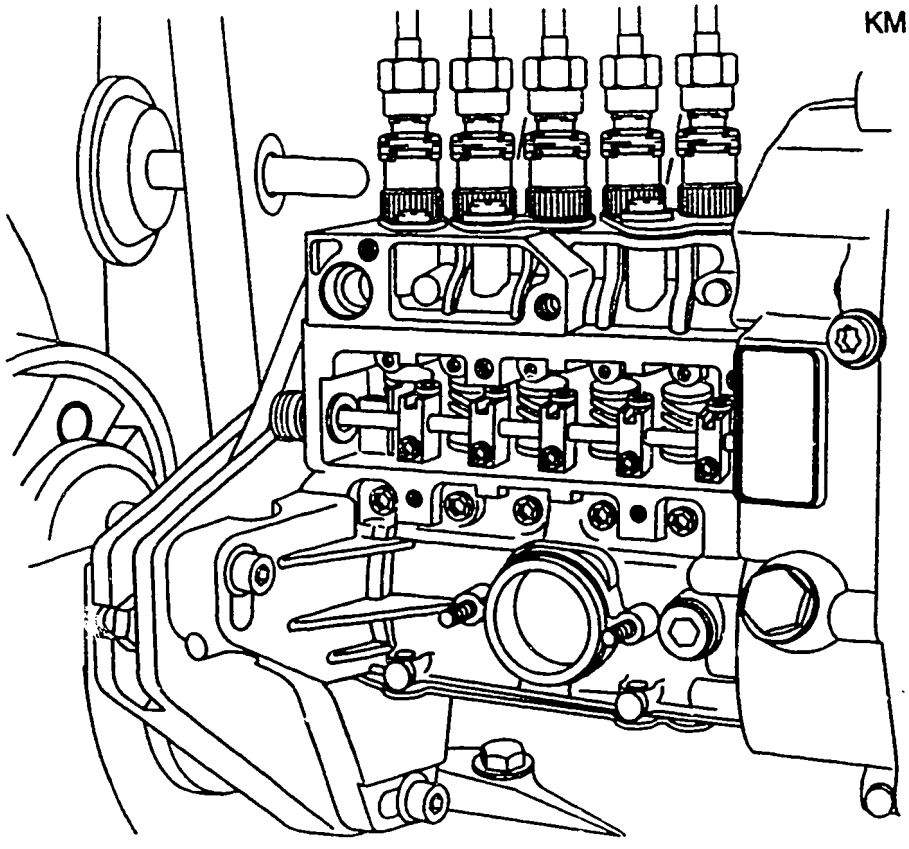


CHECKING AND ADJUSTMENT INSTRUCTIONS

Mount fuel-injection pump with positioner on injection-pump test bench.
Employ same procedure as for pumps with mechanical governor; refer to appropriate test instructions. Test equipment is indicated in test specification sheet.
Remove EHAB, supply pump and closing cover for spring chamber.

Note: If pump repairs have been carried out with adjustment of start of delivery and setting of start-of-delivery toothed disk, continue as of coordinate: D14/1

Continue: D07/1 Fig.: D06/2



CHECKING AND ADJUSTMENT INSTRUCTIONS

Checking/adjusting start of delivery:

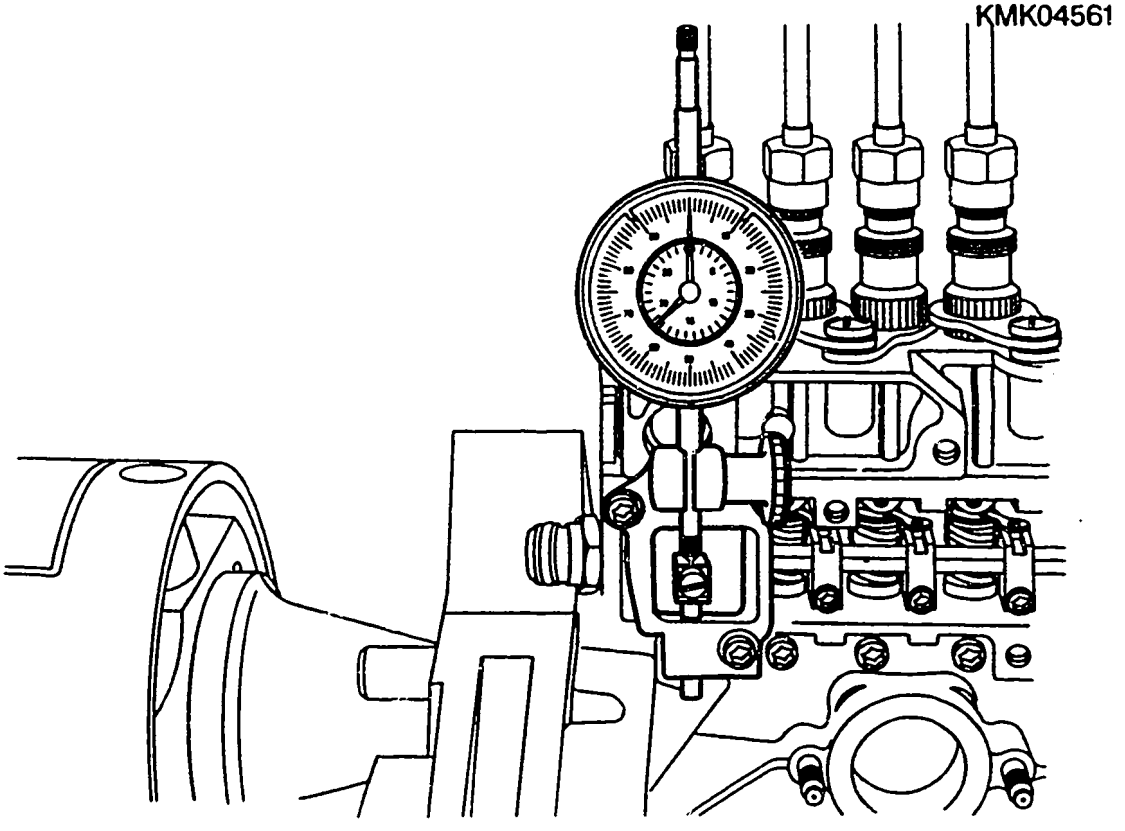
Turn camshaft in direction of rotation to set roller tappet of start-of-delivery adjustment cylinder to UT.

Mount prestroke measuring device 0 681 440 017 at adjustment cylinder.

Note: Measuring device reworked for use on pumps with EHAB, see coordinate: A17/1

New devices have already been reworked.

Continue: D08/1 Fig.: D07/2



CHECKING AND ADJUSTMENT INSTRUCTIONS

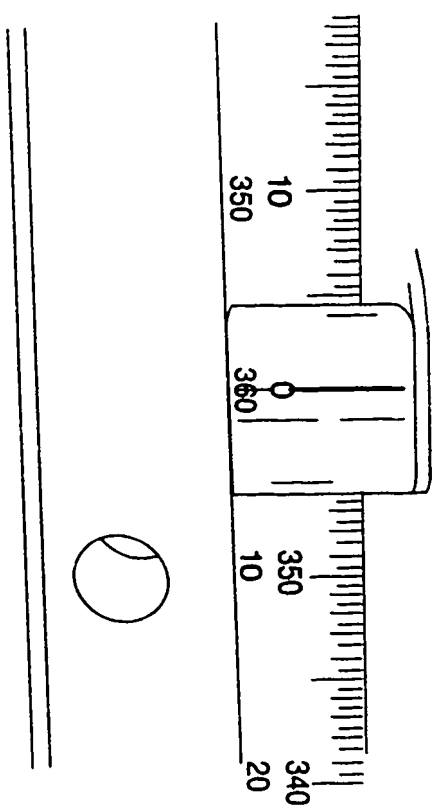
Checking/adjusting start of delivery:

Set adjustment cylinder to prestroke as per test specification sheet (mean value) and move pointer of test-bench graduated disk to 0 or to theoretically favorable initial value (5 or 6-cylinder division).

Remove prestroke measuring device without further altering pointer.

Continue: D09/1 Fig.: D08/2

KMK04573



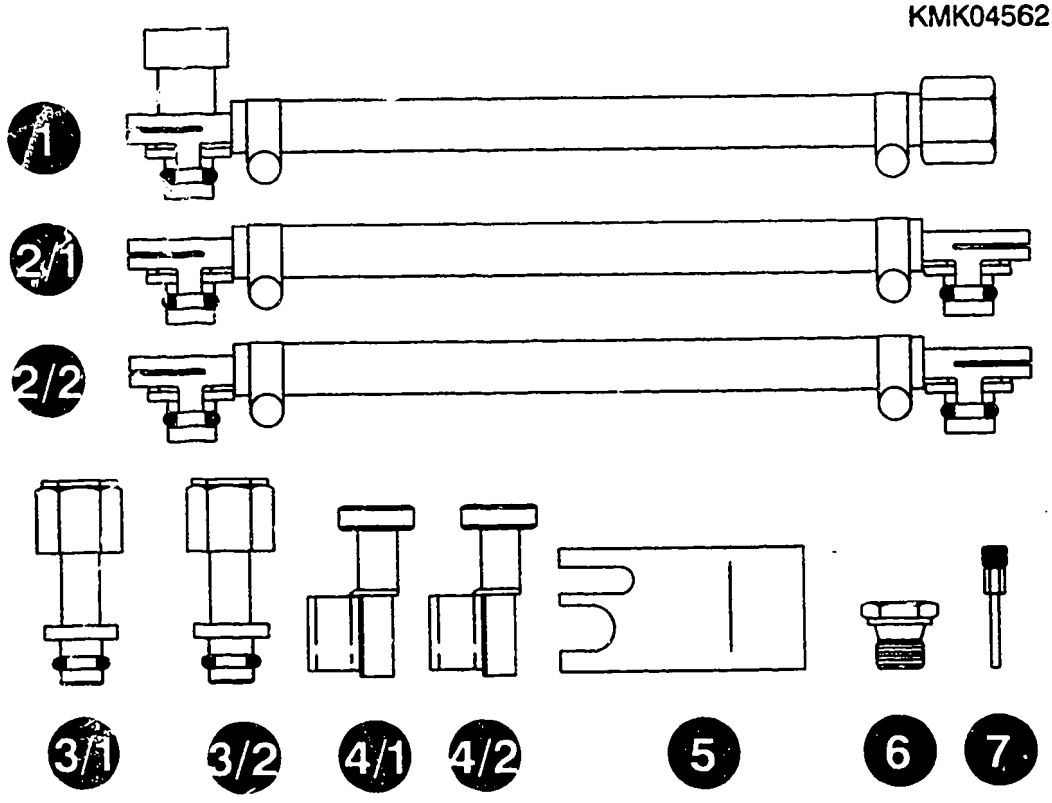
CHECKING AND ADJUSTMENT INSTRUCTIONS

Checking start of delivery:
Attach calibrating-oil connection for checking the start of delivery with the aid of the appropriate connection parts from the connection set 1 687 010 083 (EPS 912):

Parts set, complete:
1 = Hose with overflow valve
2/1, 2/2 = Hoses
3/1, 3/2 = Connections
4/1, 4/2 = Clamping pieces
5 = Retaining plate
6 = Screw plug
7 = Coupling pin (for CRT measuring device)

Continue: D10/1 Fig.: D09/2

KMK04562



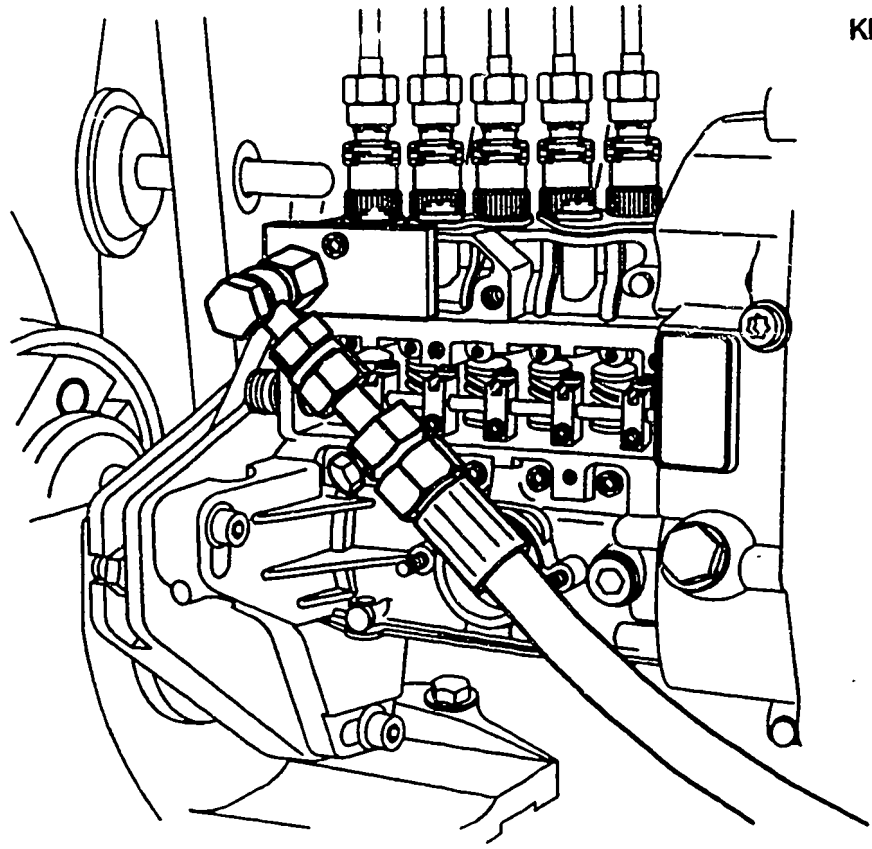
CHECKING AND ADJUSTMENT INSTRUCTIONS

Calibrating-oil connection for checking start of delivery:

Insert connection 3/1 into inlet bore in suction chamber (at EHAB flange) and secure with retaining plate 5 and one of the EHAB screws.
Use inlet union screw to attach calibrating-oil inlet line to connection.

Insert connection 3/2 into return connection on back of suction chamber, secure with clamping piece 4/1 and seal with screw plug 6.

Continue: D11/1 Fig.: D10/2



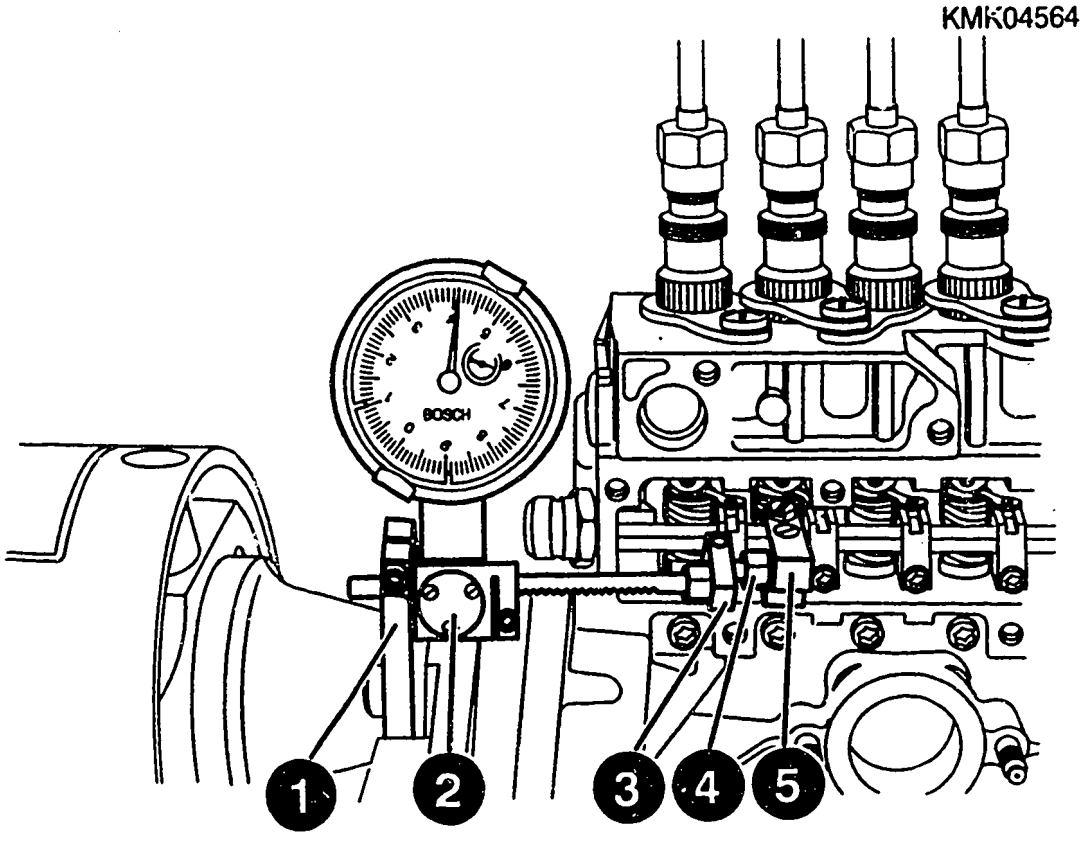
KMK04563

CHECKING AND ADJUSTMENT INSTRUCTIONS

Press off closing cap for control rod on drive end.
Attach CRT measuring device 1 688 130 130 with accessory set 1 687 000 053 and coupling pin 1 683 527 066 (see picture).

1=Support clamp	from 1 688 130 130
2=Dial indicator	from 1 688 130 130
3=Coupling piece	from 1 687 000 053
4=Coupling pin	from
connection set	1 687 010 083
5=Clamping piece	from 1 688 130 130

Continue: D12/1 Fig.: D11/2

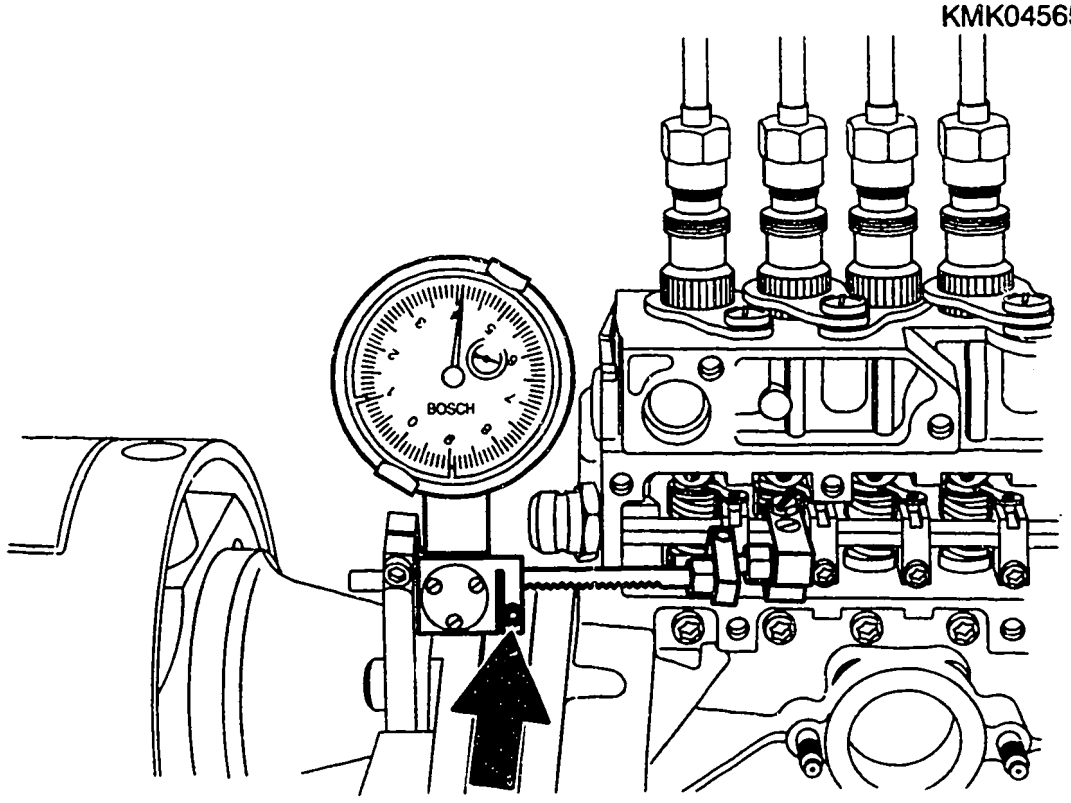


CHECKING AND ADJUSTMENT INSTRUCTIONS

Set CRT measuring device in shutoff position of control rod to 1 mm CRT. Then set control rod to prescribed CRT for checking start of delivery as per test specification sheet (can be moved by hand at clamping pieces of control rod) and block at CRT measuring device (arrow).

Continue: D13/1 Fig.: D12/2

KMK04565



CHECKING AND ADJUSTMENT INSTRUCTIONS

Check start of delivery and make any necessary correction to "prestroke" in line with existing test instructions for M-pumps.

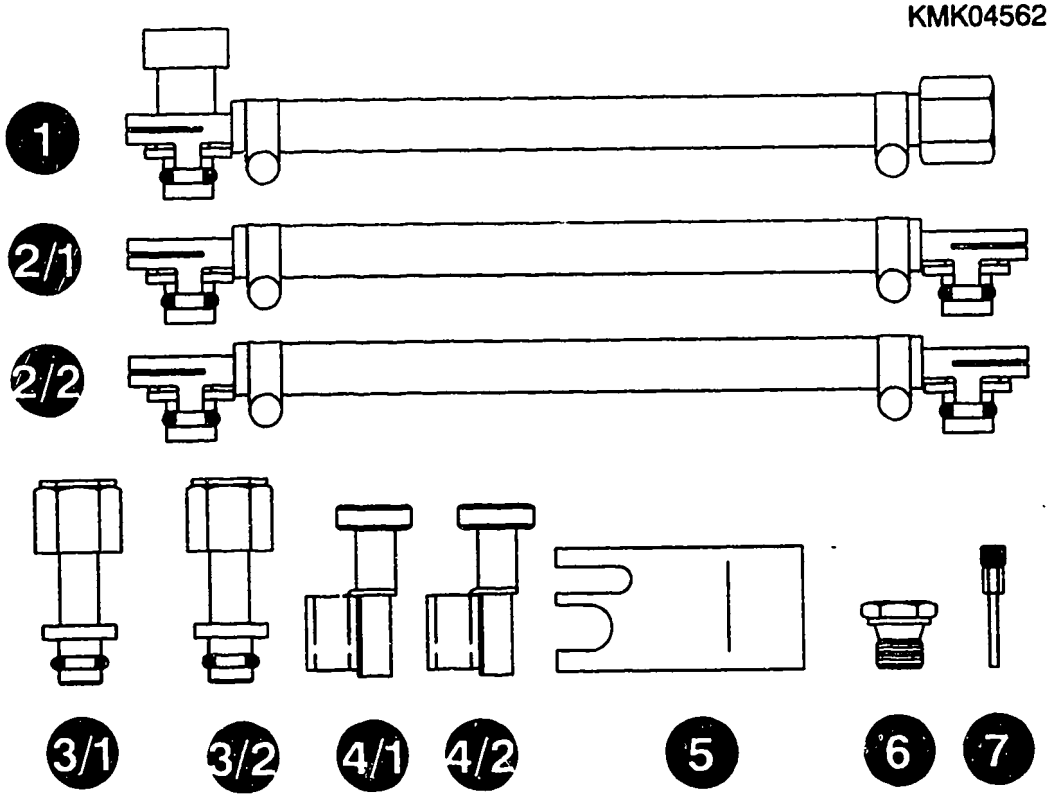
Continue: D14/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:
Attach calibrating-oil connection for checking start of delivery with the aid of the appropriate connection parts of the connection set 1 687 010 083 (EPS 912):
Parts set, complete:
1 = Hose with overflow valve
2/1, 2/2 = Hoses
3/1, 3/2 = Connections
4/1, 4/2 = Clamping pieces
5 = Retaining plate
6 = Screw plug
7 = Coupling pin (for CRT measuring device)

Continue: D15/1 Fig.: D14/2

KMK04562

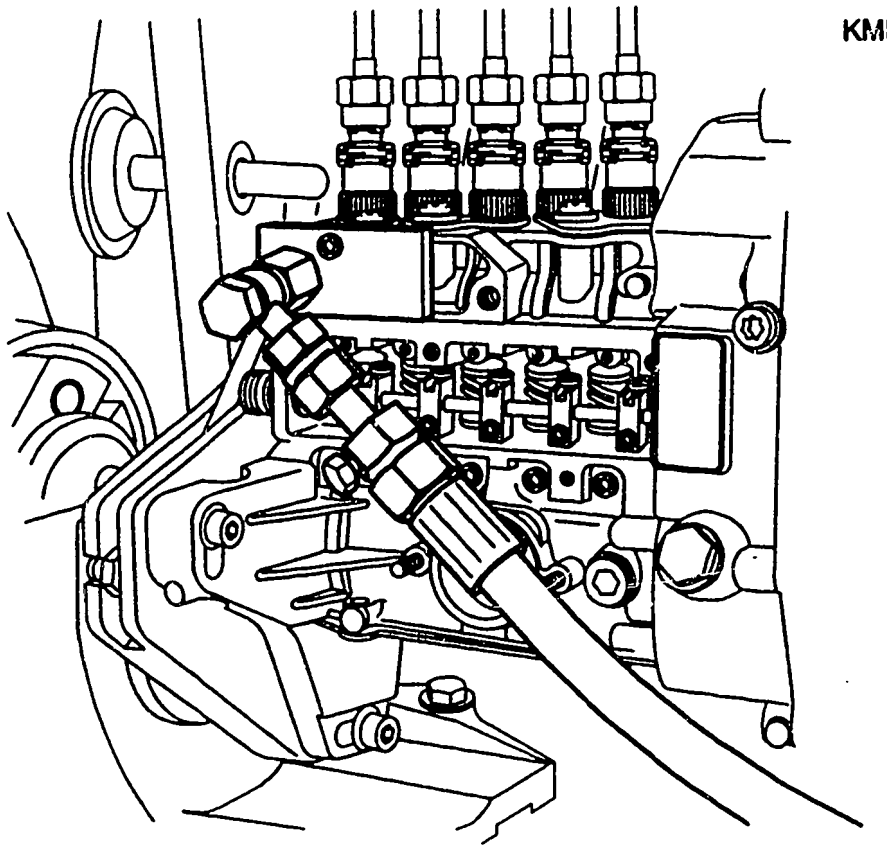


CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:

Calibrating-oil connection for checking start of delivery:
Insert connection 3/1 into inlet bore in suction chamber (at EHAB flange) and secure with retaining plate 5 and one of the EHAB screws.
Use inlet union screw to attach calibrating-oil inlet line to connection. Insert connection 3/2 into return connection on back of suction chamber, secure with clamping piece 4/1 and attach test-bench return line with overflow valve to connection.

Continue: D16/1 Fig.: D15/2



KMK04563

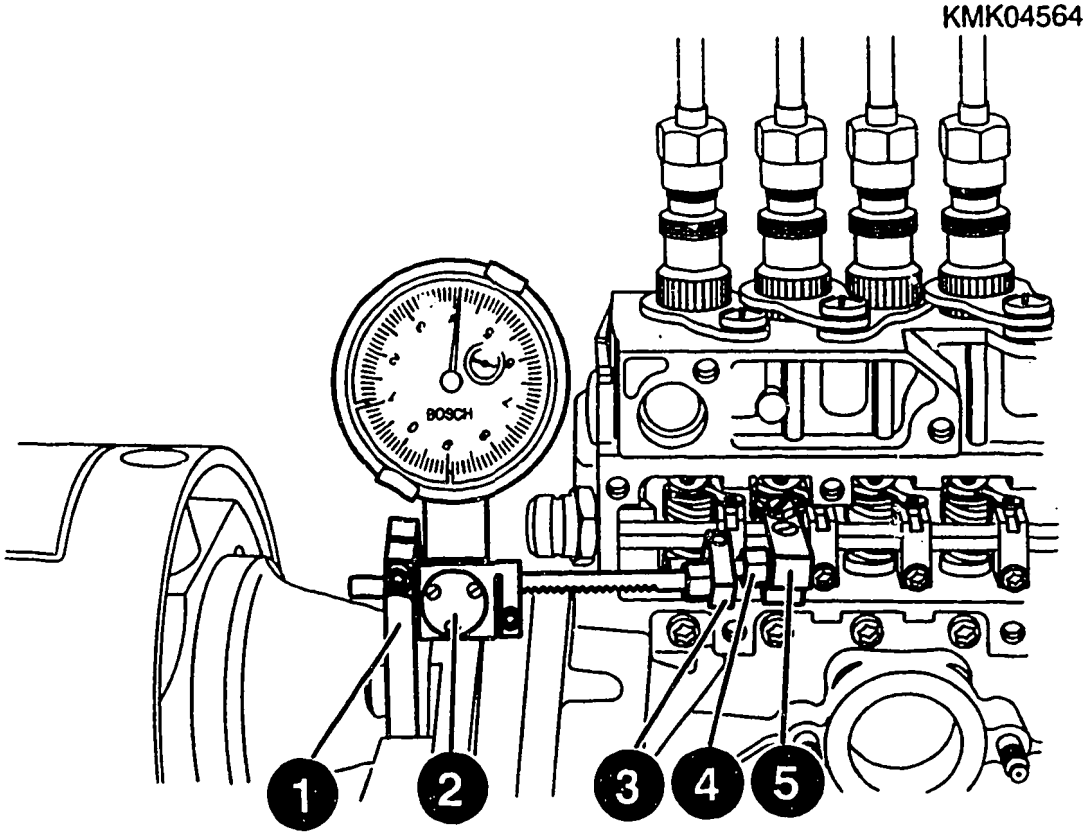
CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:
Press off closing cap for control rod on drive end.
Attach CRT measuring device 1 688 130 130 with accessory set 1 687 000 053 and coupling pin 1 683 527 066 (see picture).

1=Support clamp	from 1 688 130 130
2=Dial indicator	from 1 688 130 130
3=Coupling piece	from 1 687 000 053
4=Coupling pin connection set	from 1 687 010 083
5=Clamping piece	from 1 688 130 130

Continue: D17/1 Fig.: D16/2

KMK04564



CHECKING AND ADJUSTMENT INSTRUCTIONS

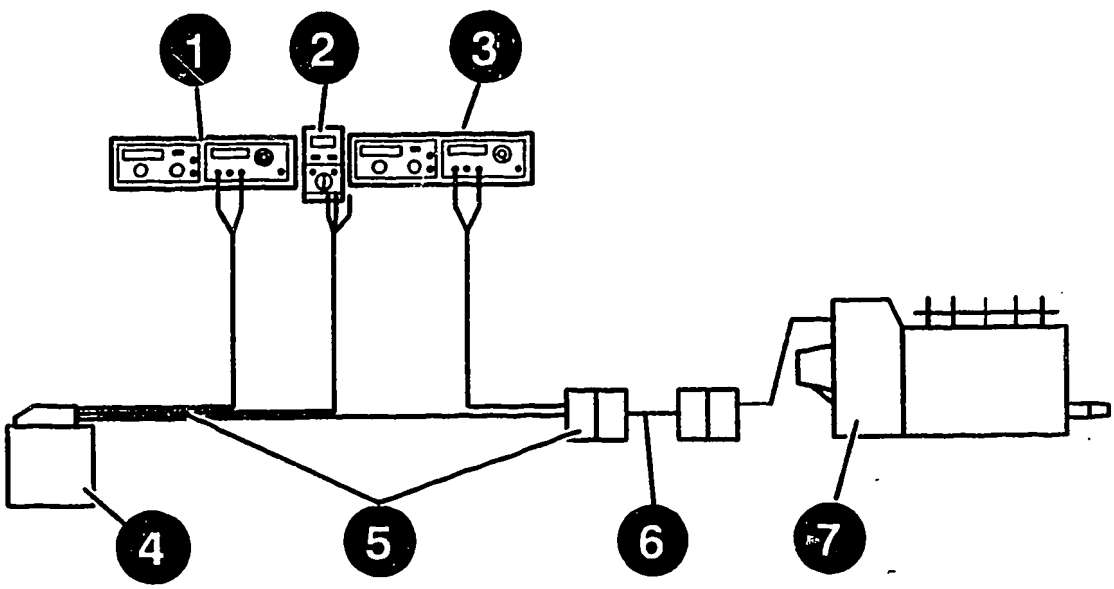
Preparation for checking positioner and injected quantity:

Electrical test equipment:
Connect up testing and supply components with cable set as per connection diagram (fig.) and following instructions:

1 = Regulator 12 V/3 A. Test-lead connector: red (+), black (-).
2 = Digital voltmeter 0...5 V. Connector: red=reference voltage (U/ref), green=output voltage (U/act), blue=measurement ground.

Continue: D18/1 Fig.: D17/2

KMK04574



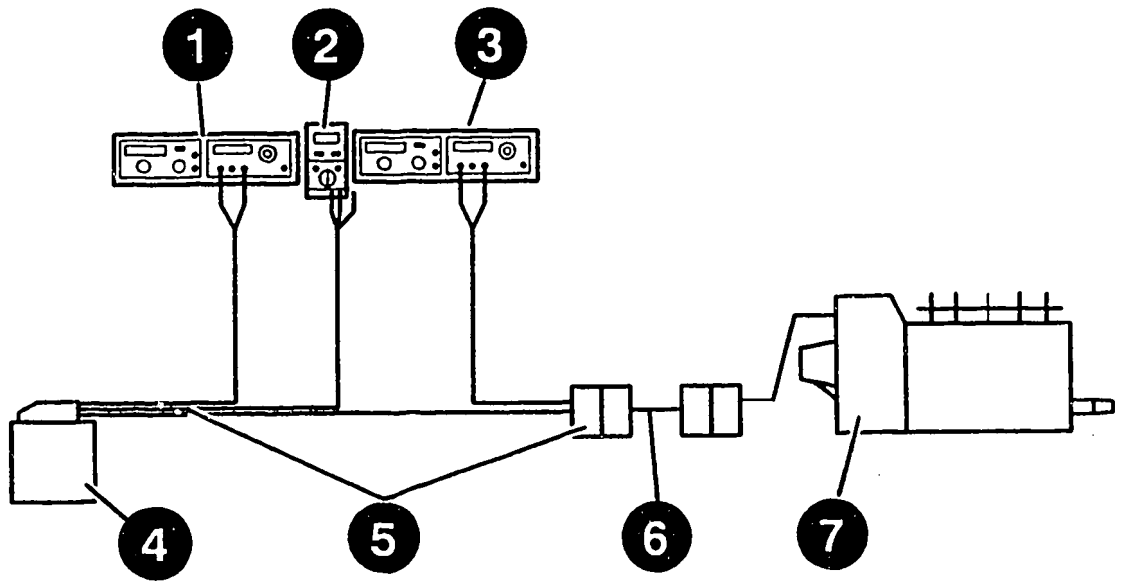
CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:

3 = Regulator 12 V/15 A (variable current). Test lead connector: red (+), black (−)
4 = Test control unit (universal evaluation circuit) 0 986 610 101 (KDEP-P 400/1)
5 = Universal test lead 0 986 610 102 (KDEP-P 400/2).

Continue: D19/1 Fig.: D18/2

KMK04574



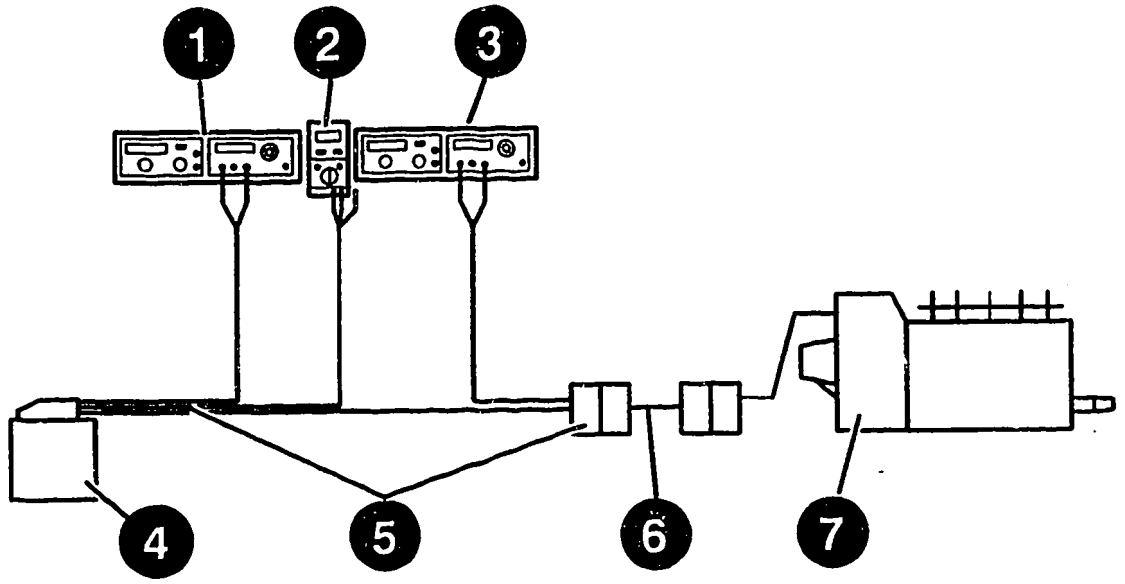
CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:

6 = Adapter lead (test adapter) 0 986 610 112 (KDEP-P 400/9) as connection between positioner and universal test lead.
7 = Positioner.

Continue: D20/1 Fig.: D19/2

KMK04574



CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:

Use plug to seal mounting hole for supply pump in pump housing.

Pour approx. 100 cm3 of lubricating oil 20 W 20 into camshaft chamber by way of oil overflow of pump housing.

Continue: D20/2

TESTING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:

Electrical test equipment:

Switch on regulator for supplying test control unit (evaluation circuit).
Setting: 13.0...14.0 V, approx. 2 A.

Continue: D21/1

TESTING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:
Voltmeter:
* Connection for testing U/ref (reference voltage of test control unit/ supply voltage for RPS): red (+), blue (−).
  Desired reading: 4.99...5.01 V.
  Incorrect value: tester defective.
* Connection for all other tests (U/act): green (+), blue (−).

Note: U/act represents the voltage calculated by the tester from the RPS signal and is thus a measure of the control rod travel.

Continue: D21/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

Preparation for checking positioner and injected quantity:

Switch on regulator for positioner.
Initial current setting: 0 A.

Note: The control rod can be moved as required by way of current adjustment on the regulator; this is difficult to achieve by hand on account of the strong control-rod return spring. The sustained current application for maximum CRT is to be restricted to 1 minute at most on account of the self-warming of the servo magnet.

Continue: D22/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

Warm up unit:
Switch on regulator for positioner.
Set approx. 10 mm CRT by way of current adjustment and block with CRT measuring device. Do not switch off regulator.
Switch on test bench, set inlet pressure as per test specification sheet. Observe direction of rotation and allow unit to warm up for at least 3 minutes at n = 1000 1/min.
At the same time, heat up calibrating oil to inlet temperature as per test specification sheet. Then release control-rod blocking, set current 0 A and shut off injection pump.

Continue: D22/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

Setting CRT measuring device and checking maximum control-rod travel:

Set dial indicator to exactly 1 mm CRT with magnet deenergized. Leave setting as it is during the following tests.

Switch on regulator for servo magnet.
Set maximum CRT by way of current adjustment (max. 1 minute).
Set value: 18.4...19.7 mm.
If value not attained: Servo magnet or control rod stiff; fault in fuel-injection pump.

Continue: D23/1

TESTING AND ADJUSTMENT INSTRUCTIONS

Checking RPS setting
("Setting" as per test specification sheet):

Set control rod by way of current adjustment such that U/act exactly corresponds to stated value. (Perform precision adjustment by hand at control rod).

The control rod travel must then likewise correspond to the value given in the test specification sheet (check value "P").

OK?

Yes: D27/1 No: D23/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

Adjusting RPS:

The RPS fastening screw (tapered clamping screw) is accessible from outside through a hole. This hole is secured against tampering by a plastic plug and sealed.

To adjust, remove plastic seal as follows:

Continue: D24/1

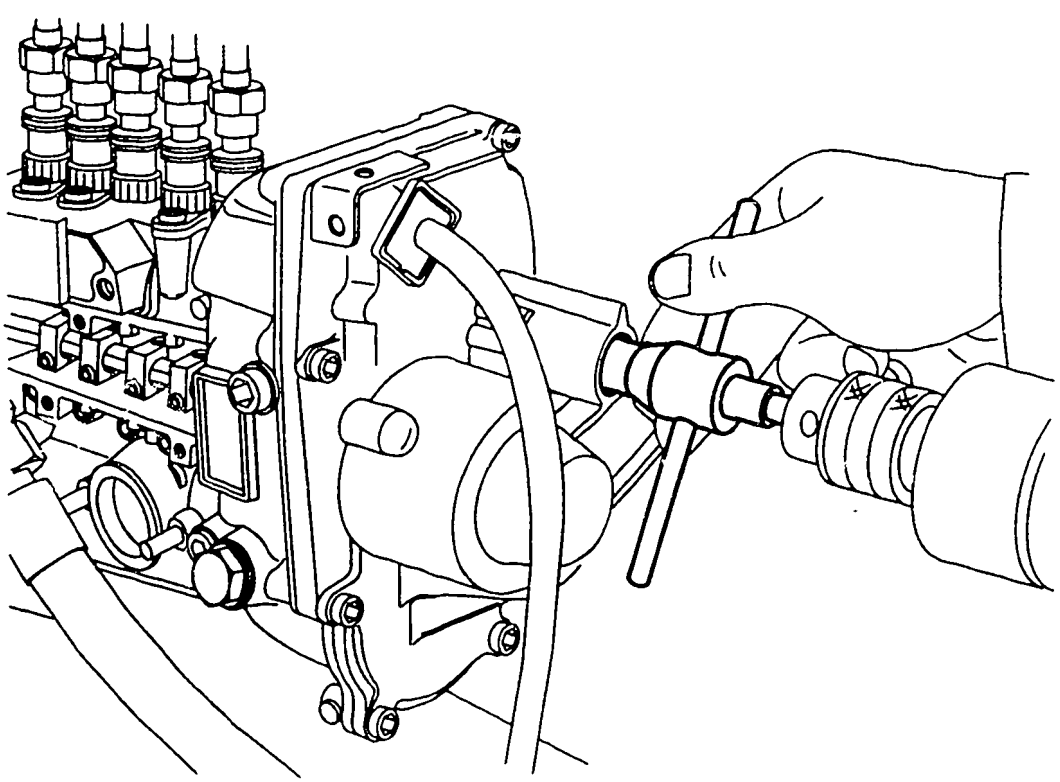
TESTING AND ADJUSTMENT INSTRUCTIONS

Removing plastic seal from RPS adjustment bore:

Seal can only be removed and destroyed by drilling it out with 12 mm drill. When doing so, hold seal with pin-type socket wrench 0 986 611 459 (KDEP 2990) to stop it turning and drill out until it is pierced (retainers break off).
Attention: Drill at low speed and do not use excessive force. After penetration, pull back drill immediately so that tip cannot catch and damage rack position sensor.

Continue: D25/1 Fig.: D24/2

KMK04575



CHECKING AND ADJUSTMENT INSTRUCTIONS

Adjustment procedure:

* Set control rod travel exactly to "setting" as per test specification sheet (mean value of tolerance band, e.g. 12.5 mm) and block at CRT measuring device.

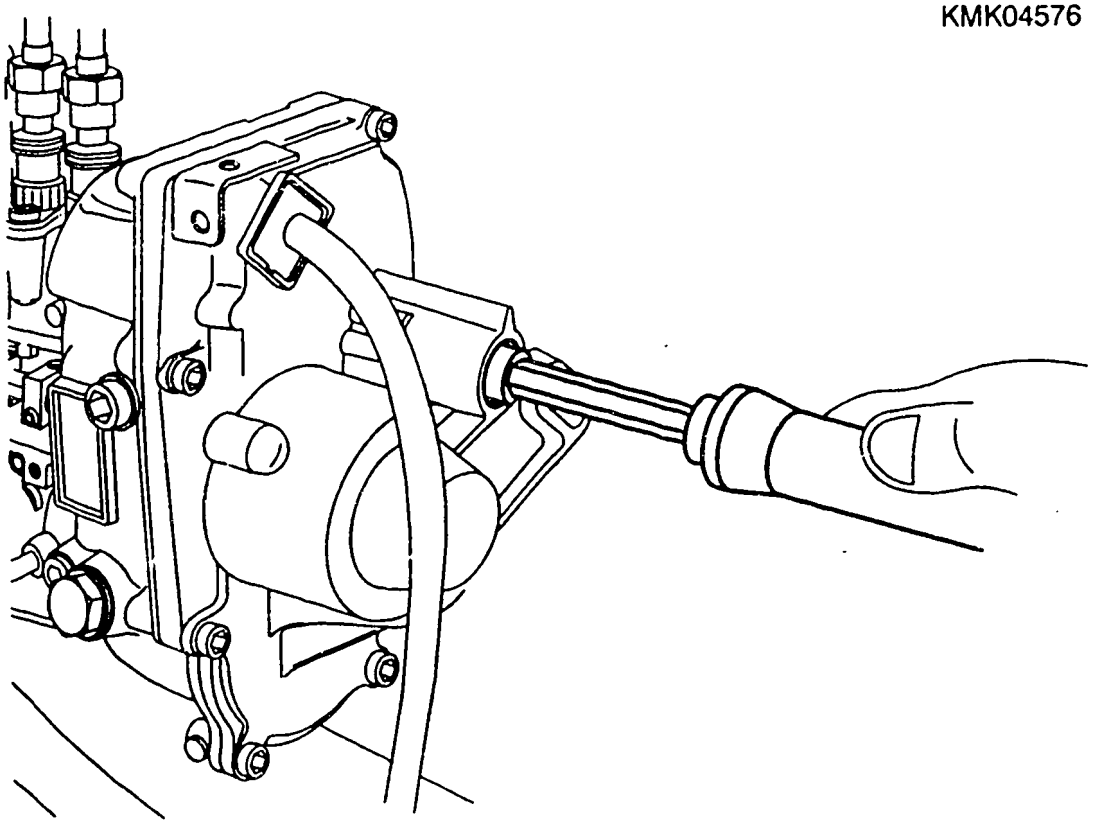
Continue: D26/1

TESTING AND ADJUSTMENT INSTRUCTIONS

* Loosen clamping screw for RPS (5 mm hexagon socket) and move rack position sensor with Allen wrench such that U/act precisely corresponds to "setting" as per test specification sheet.
* Tighten clamping screw in this position to tightening torque of 15...18 Nm.
  Note: Tighten uniformly and smoothly, and adhere precisely to tightening torque, so as to avoid seizure of tapered clamping screw in RPS clamping sleeve.
* Check adjustment again and correct if necessary.

Continue: D27/1 Fig.: D26/2

KMK04576



CHECKING AND ADJUSTMENT INSTRUCTIONS

Checking RPS "Check value" as per test specification sheet:

By way of current adjustment and precision adjustment by hand, set position of control rod such that U/act corresponds to the "Check value". The CRT must then be within the stated tolerance.

OK?

Yes: D28/1 No: D27/2

TEST AND ADJUSTMENT INSTRUCTIONS

If check value is outside tolerance despite correct adjustment of "setting", the rack position sensor is defective, i.e. diassembly, repair and assembly of positioner, as well as repetition of all tests.

Continue: D28/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

After adjusting RPS insert new plastic seal (anti-tamper safeguard) with new seal ring and press in until lugs are heard and felt to engage.

Note: The service plastic seal is red, as opposed to the black factory seal.

Continue: E01/1

TESTING AND ADJUSTMENT INSTRUCTIONS

Checking and adjusting delivery:

* Affects test items V1 and L1 as per test specification sheet.

  U/act value is set by adjusting current. Precision adjustment is effected by hand by moving the control rod. Precise U/act value is fixed by blocking control rod at CRT measuring device.

Continue: E01/2

TESTING AND ADJUSTMENT INSTRUCTIONS

* Basic adjustment as per test item V1: Run pump at speed indicated. By way of current adjustment and precision adjustment by hand, set exact U/act value for V1 and block.
* Measure injected quantity. Values must coincide with test specification sheet.
  Note: Determination of mean value and scatter as for pumps with mechancial governors. Check values are marked "P"; values with no "P" apply to new settings.
* Are injected-quantity values OK?

Yes: E03/1 No: E02/1

E01

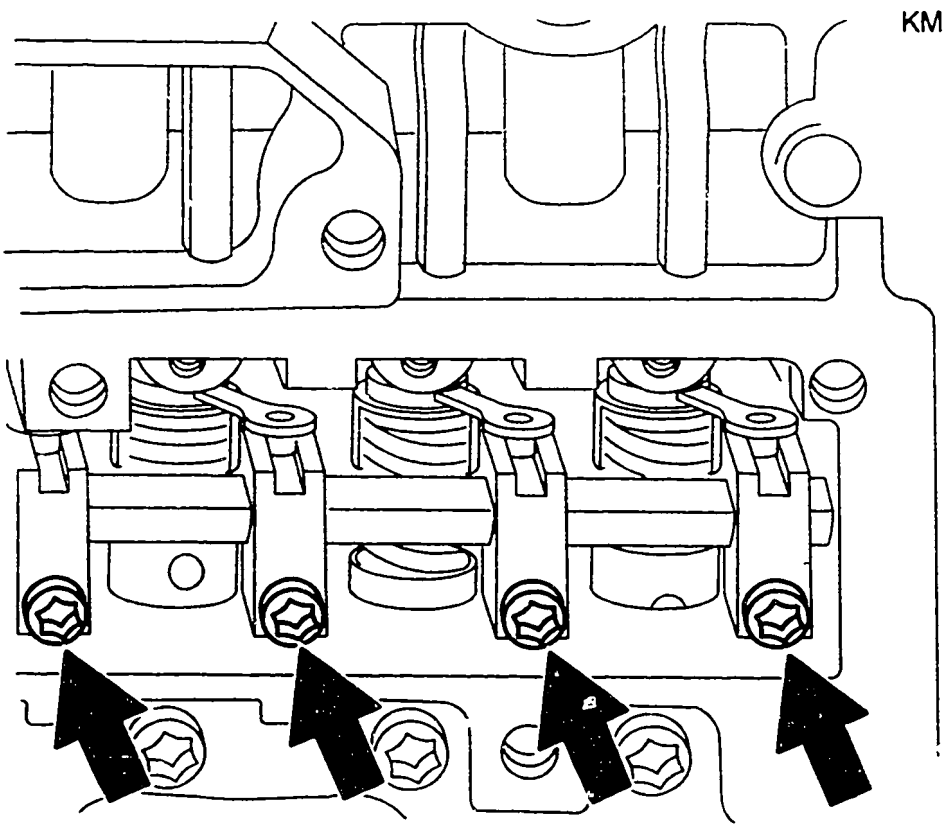
CHECKING AND ADJUSTMENT INSTRUCTIONS

Set mean value and equal delivery as per test item V1.

Correct deliveries as for mechanically governed fuel-injection pumps by moving clamping pieces on control rod (arrows).

Continue: E03/1 Fig.: E02/2

KMK04577



CHECKING AND ADJUSTMENT INSTRUCTIONS

Then perform test item L 1:

Run pump at stated speed. By way of current adjustment and precision adjustment by hand exactly set U/act value for L1 and block.

Perform quantity measurement L1. Quantity value and tolerance must be in line with data given in test specification sheet.

OK?

Yes: E04/1 No: E03/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

Possible causes of trouble:

* Quantity value outside tolerance despite correct U/act value:

  + RPS defective.
  + Injection pump worn; possibly incorrect plunger-and-barrel assemblies

* Excessive scatter.
  + Scatter can be optimized at L 1, but this must not lead to exceeding of tolerances at V 1.
  + Injection pump worn.

Continue: E04/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

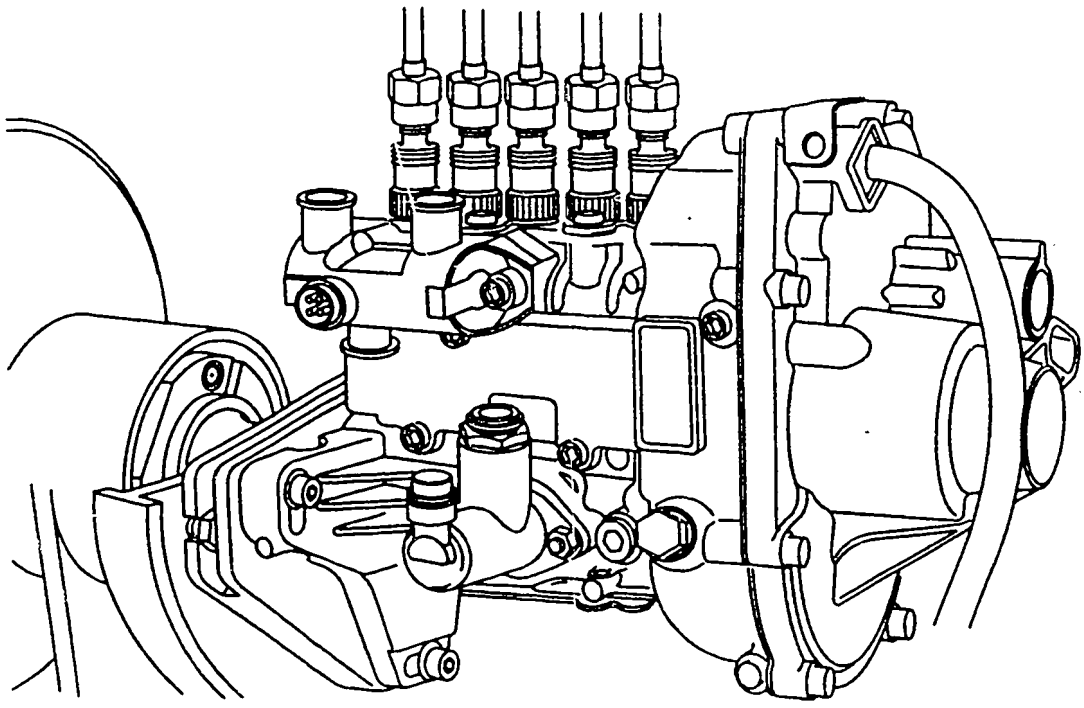
EHAB functional test:

Note: The function of the EHAB is described on coordinate: A05/1

Closing cover for spring chamber, EHAB and supply pump fitted on fuel-injection pump.

Continue: E05/1 Fig.: E04/2

KMK04578



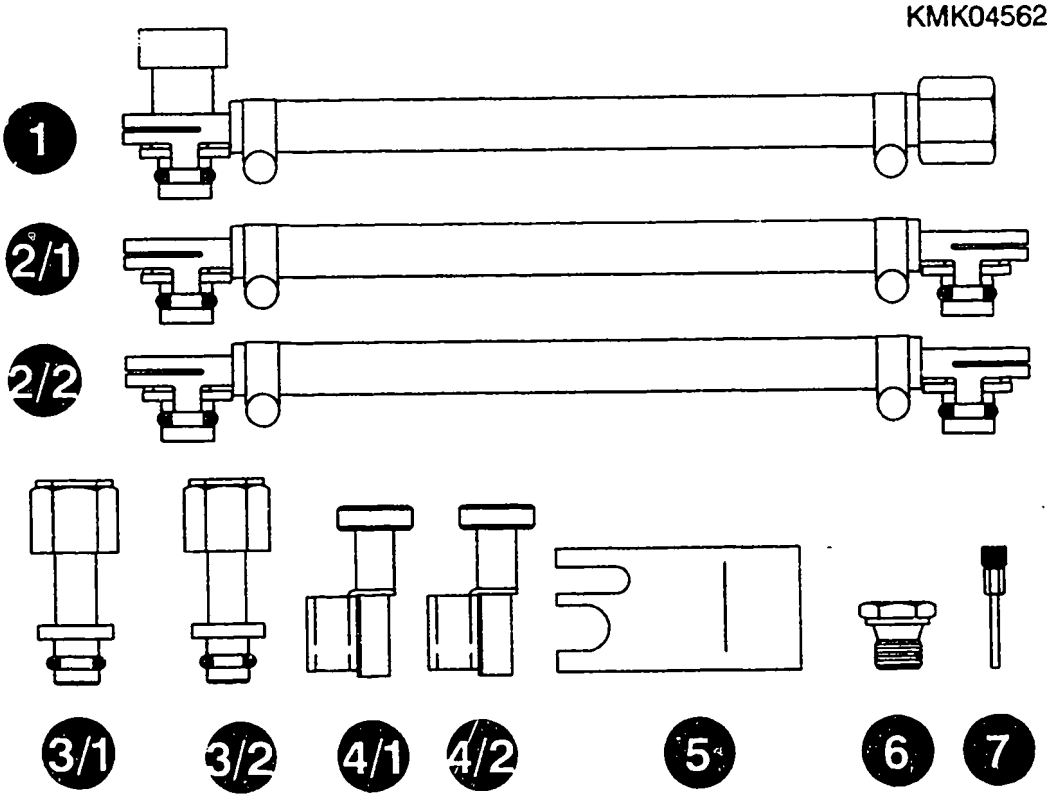
CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

Connect up calibrating-oil supply for EHAB test with appropriate connection parts from connection set 1 687 010 083 (EPS 912).
Parts set, complete:
1 = Hose with overflow valve
2/1, 2/2 = Hoses
3/1, 3/2 = Connections
4/1, 4/2 = Clamping pieces
5 = Retaining plate
6 = Screw plug
7 = Coupling pin (for CRT measuring device)

Continue: E06/1 Fig.: E05/2

KMK04562



CHECKING AND ADJUSTMENT INSTRUCTIONS

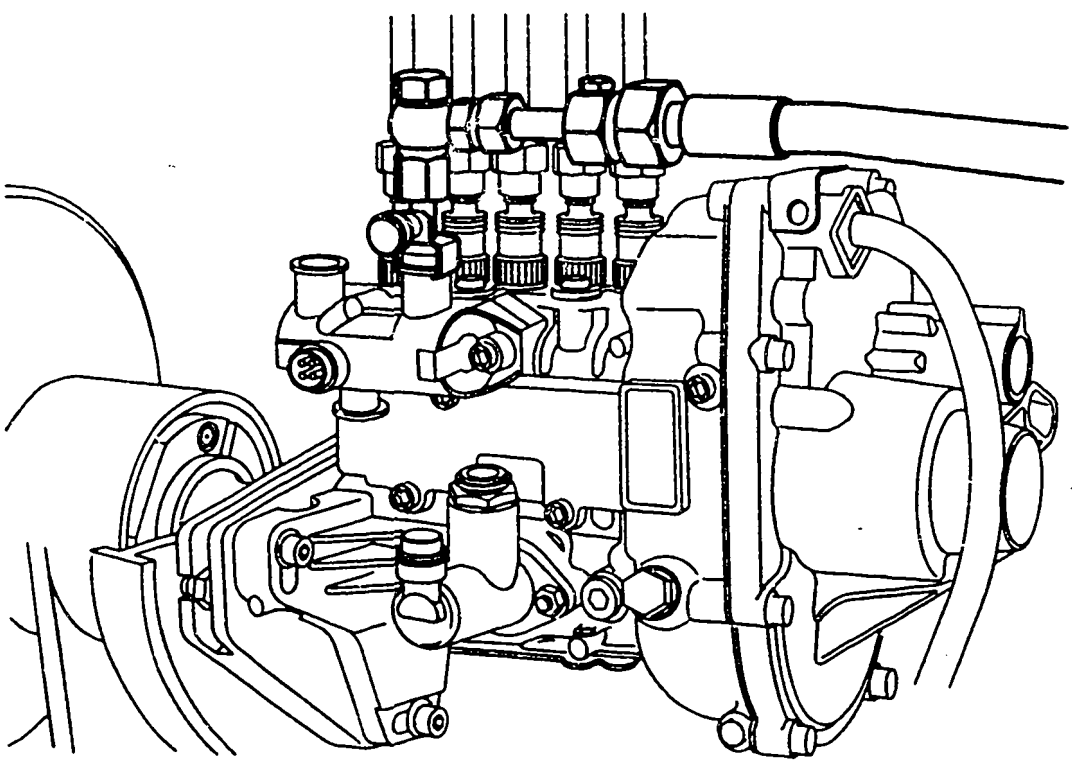
EHAB functional test:

Calibrating-oil supply for EHAB test:

* Attach connection 3/1 with inlet union screw and seal rings to calibrating-oil inlet hose of test bench.
  Insert connection into top right of EHAB inlet and secure with clamping piece 4/1.
  Note: Keep to sequence.
  Attaching the hose to the already installed connection could damage the plastic EHAB.

Continue: E07/1 Fig.: E06/2

KMK04579



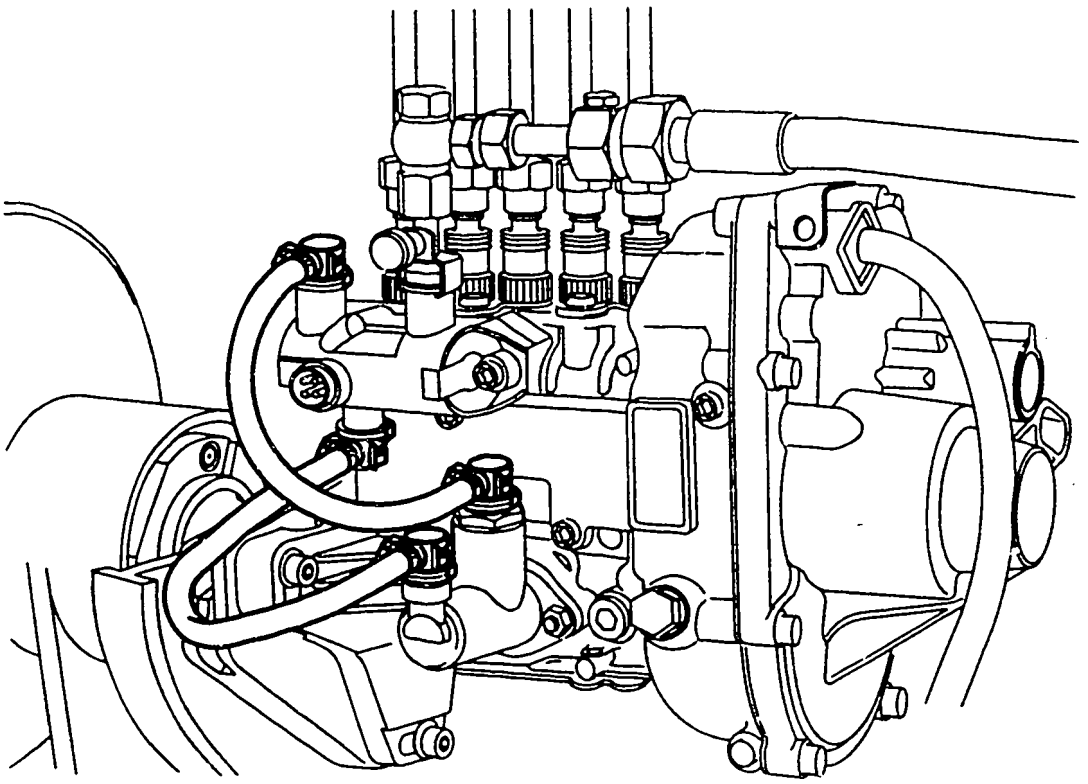
CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

* Attach inlet connection (outer) of supply pump by way of hose 2/1 to EHAB connection at bottom; secure plug connections with the (captive) retainers.
* Attach delivery connection (inner) of supply pump by way of hose 2/2 to top left of EHAB connection; secure plug connections with retainers.

Continue: E08/1 Fig.: E07/2

KMK04580



CHECKING AND ADJUSTMENT INSTRUCTIONS

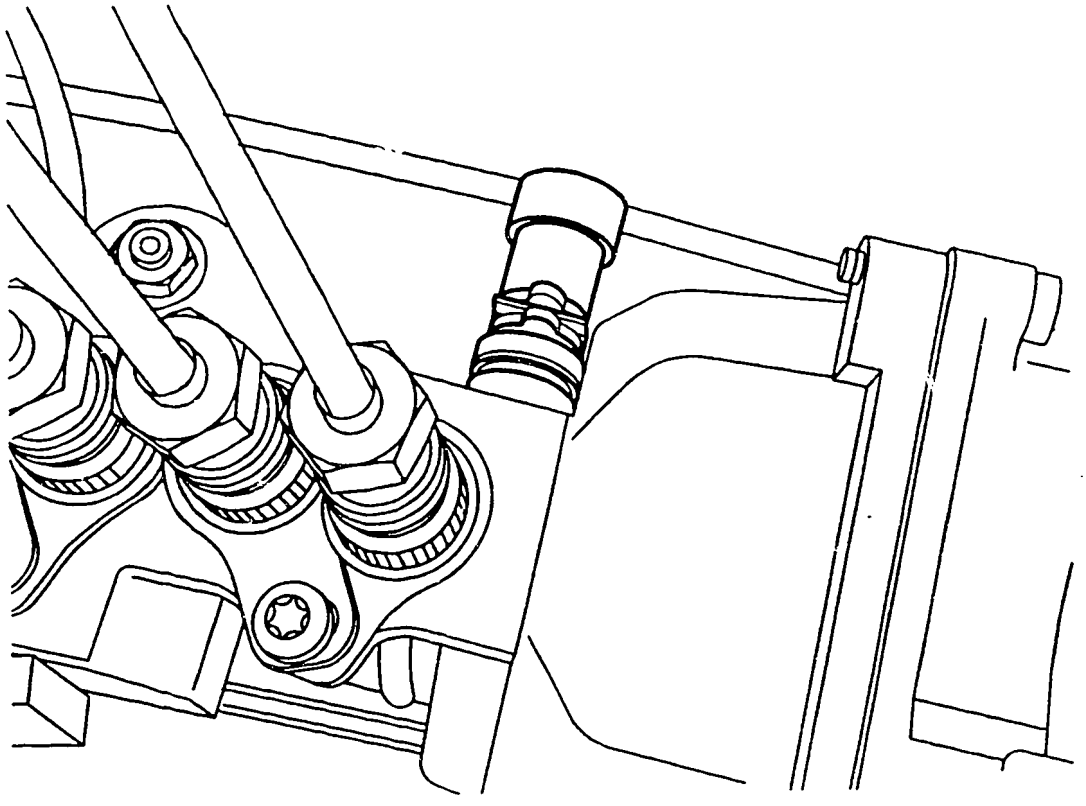
EHAB functional test:

* Insert hose 1 (with original Mercedes-Benz overflow valve) at suction-chamber return connection and secure with retainer.

* Connect test-bench return line with inlet union screw and seal rings to threaded nipple of hose 1.

Continue: E09/1 Fig.: E08/2

KMK04581



CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

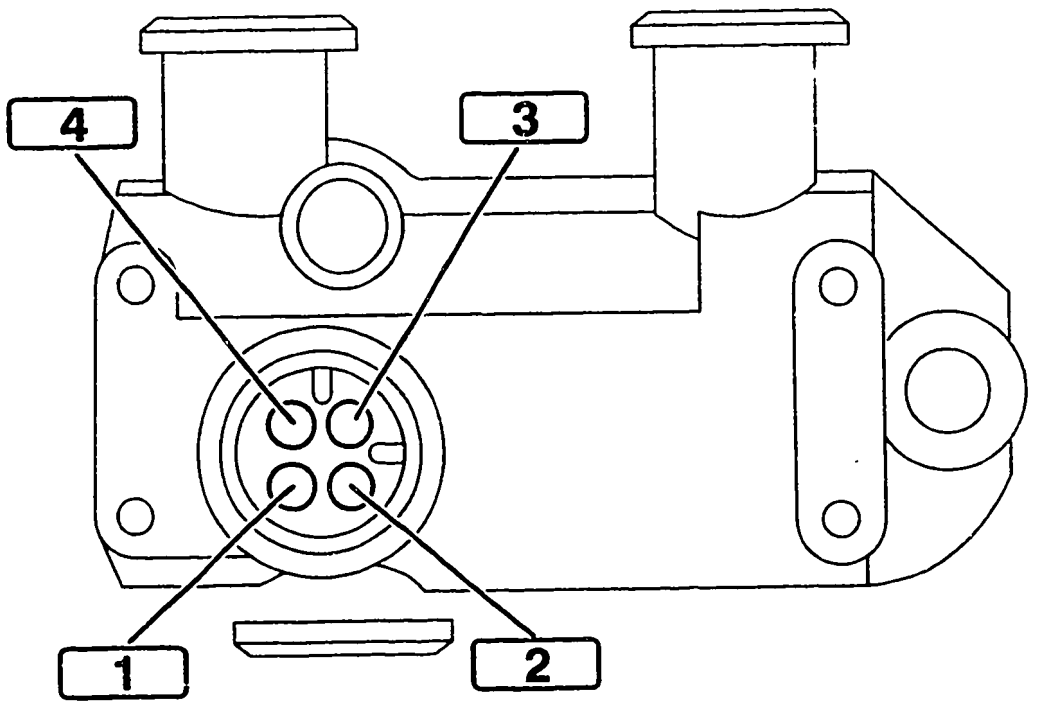
Electrical connection:

12 V power supply: from regulator (for test control unit) with suitable individual test leads, e.g. from test cable set (case) 1 687 011 208. Attachment to the two right-hand EHAB pins (see fig., pin 2 = –, 3 = +). Leave power supply switched off for the time being.

Pay attention to the special notes on the following coordinate.

Continue: E10/1 Fig.: E09/2

KMK04572



CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

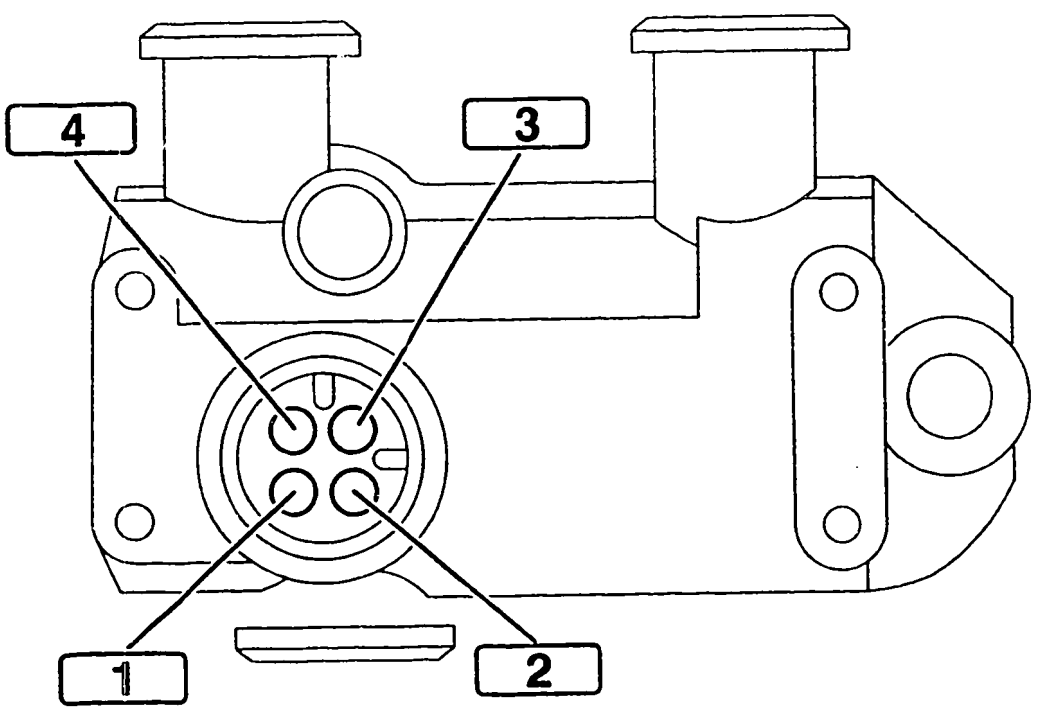
Special notes:

Pin assignment on 4-pin EHAB connection:
Pin 2 - 3 = EHAB (2 = -, 3 = +)
Pin 1 - 4 = Fuel temperature sensor

EHAB current application without throughflow of calibrating oil max. 1 minute.
Voltage is not to be applied to the two left-hand pins as this would destroy the temperature sensor.

Continue: E11/1 Fig.: E10/2

KMK04572



CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

* Switch on test bench.
* Run pump at n = 1000 1/min.
* Switch on EHAB power supply.
* Set calibrating-oil inlet pressure 0.5...1.0 bar.
* By adjusting current for positioner set full-load control-rod position (U/act as per test specification sheet, V1 value).
* Following completion of warm-up time (system vented, calibrating-oil temperature as per test specification sheet reached) set inlet pressure to 0 bar.

Continue: E11/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

* Observe quantity delivered at full load and switch off EHAB power supply.
  Delivery must drop to 0 within 2 seconds.

OK?

Yes: E13/1 No: E12/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

Possible causes of trouble if switching to zero delivery does not take place:

* EHAB defective.

  Replace EHAB and repeat test.

Continue: E12/2

CHECKING AND ADJUSTMENT INSTRUCTIONS

EHAB functional test:

Possible cause of trouble if switching to zero delivery is too slow (sequence reflects likelihood):

* Leak in overflow valve in test line 1 (suction chamber return).
  The overflow valve must be leakproof in the direction opposite to the direction of flow.
* EHAB defective. Replace EHAB.
* Supply pump defective. Replace supply pump.

Continue: E13/1

CHECKING AND ADJUSTMENT INSTRUCTIONS

Concluding operations:

If still to be done, insert RPS seal (plastic plug) with new seal ring.
Attach closing cap for control rod (pump drive end).
Apply sealing paint to one screw each on closing cover of spring chamber and positioner cover.
Remove pump from test bench and clean off calibrating oil.

Continue: N27/1

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EDITORIAL NOTE

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EDITORIAL NOTE

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